February 5, 1920 American Machinist Vol. 52, No. 6

Machining Cylinders for the Fordson Tractor

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Although many of the methods employed in building the Fordson motor are similar to those developed by the Ford Motor Co., there are numerous differences, as will be seen by following the various operations. This is a heavier motor in every way, and special machines have been devised for it. The two types of continuous milling machines shown in this article by illustrations are particularly interesting.

WE ARE apt to look upon the tractor as a crude machine, and, realizing that it rarely moves over 8 miles an hour, we fail to appreciate the strenuous service to which the motor is subjected. The average automobile motor is working at a comparatively small percentage of its maximum power a large proportion of the time. It is only when we come to a long, hard grade, or strike a long stretch of bad road, that it is subjected to heavy duty for any length of time.

Strange as it may seem, the tractor motor and the airplane motor may perhaps be best compared for continuous service at high power, the great difference being that it is permissible to use all the weight necessary in the tractor motor, while this is not the case with motors for aircraft work. Tests of standard automobile motors by builders of farm tractors have shown conclusively that while they do admirable work in the automobile, they are entirely unsuited for the continuous heavy duty of the tractor. Another serious factor is the constant presence of dust and dirt, which filter into the carburetor and to the bearings in spite of all the precautions which can be taken to prevent it.

A direct comparison of this difference may be had in the case of the Fordson tractor, which will be found to be much heavier in every way than the well-known Ford motor.

There are 54 operations on this cylinder, so that only the main operations which differ, more or less, from those of the Ford motor, or which involve the use of special machinery or fixtures, are illustrated in this article.

The operations begin with the milling of four locat-

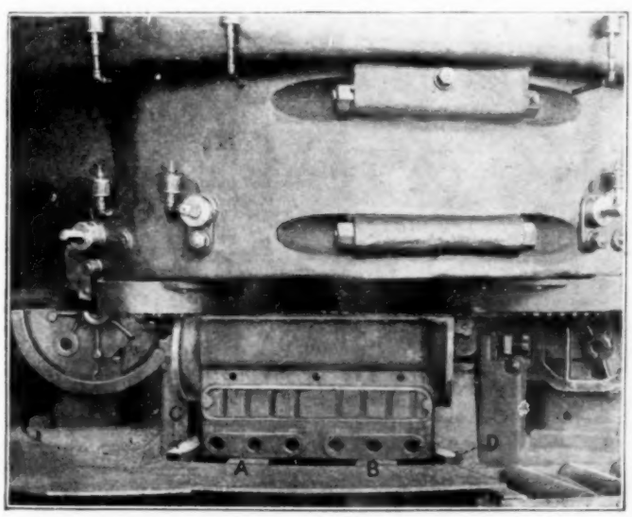


FIG. 2. FACING THE BOTTOM FLANGE ON CONTINUOUS MILLING MACHINE

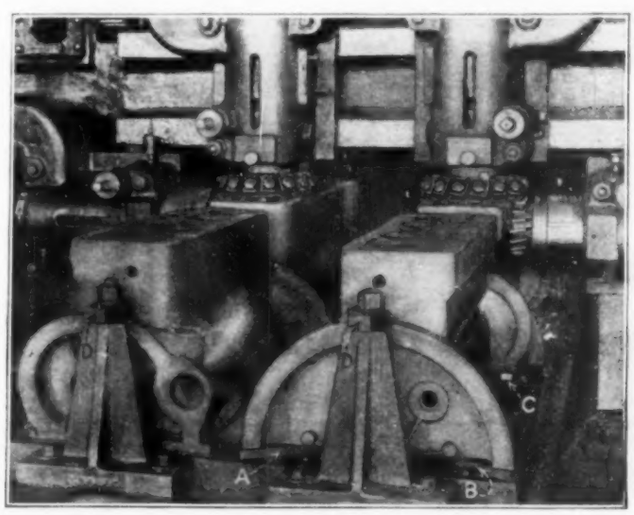


FIG. 3. MILLING TOP AND SIDES ON A LARGE CONTINUOUS MILLING MACHINE

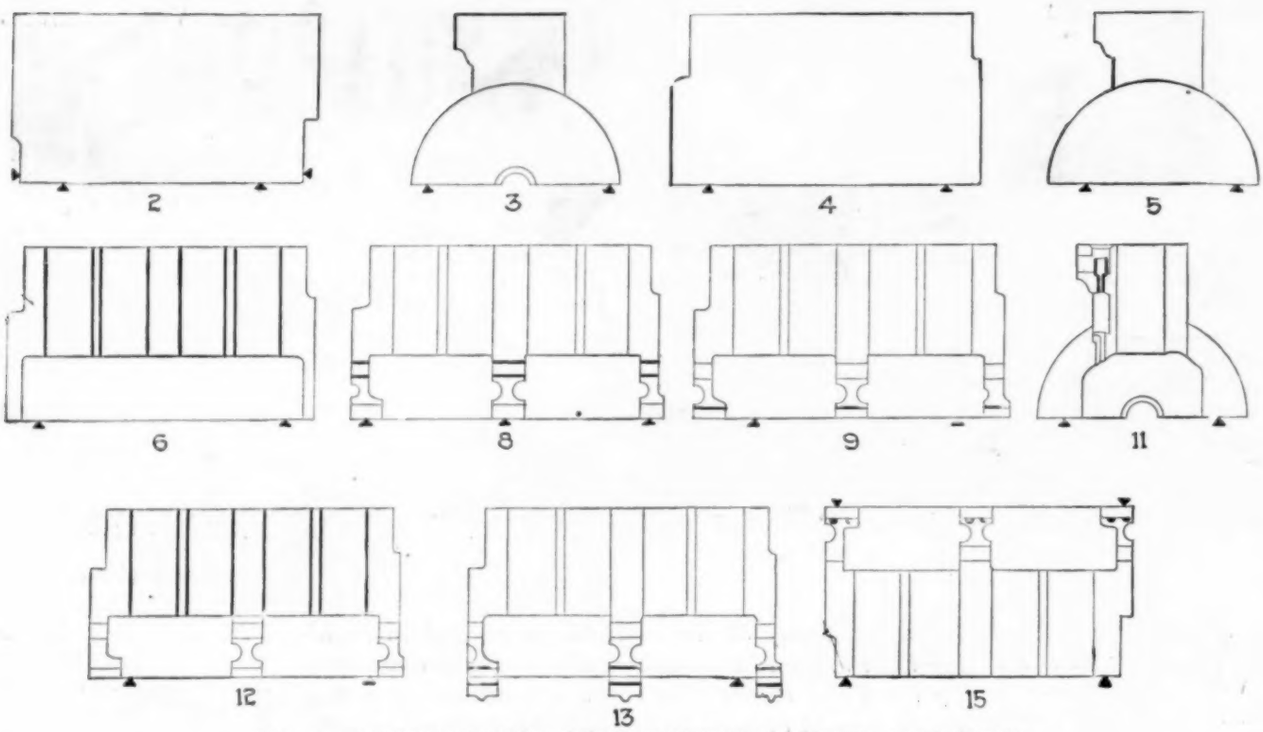


FIG. 1. TRANSFORMATION SHEET SHOWING PRINCIPAL OPERATIONS

ing spots on top of the cylinder, the same as for the Ford motor. The operations which have been selected for illustration are shown in outline in the transformation sheet, Fig. 1, being numbered to correspond with the halftone illustrations showing the work being done.

Having milled the locating spots, the cylinder blocks go to a large Ingersoll milling machine of the horizontal-table continuous type shown in Fig. 2. The blocks come to the machine on the roller conveyor shown at the right, and are then locked in position on the strips *A* and *B* and between *C* and *D*. This machine carries 10-in. diameter cutters, some having 14 blades and the others 18 blades. These both rough and finish the bottom flange of the cylinder block at one revolution of the table, the production being 145 cylinder blocks in 8 hours.

The 12 bolt holes for the three bearings are next drilled, this being another departure from average automobile practice, and made necessary by the larger bearings and heavier duties which they must perform. Then two holes of the main bearing are reamed and used as locating points for all future operations.

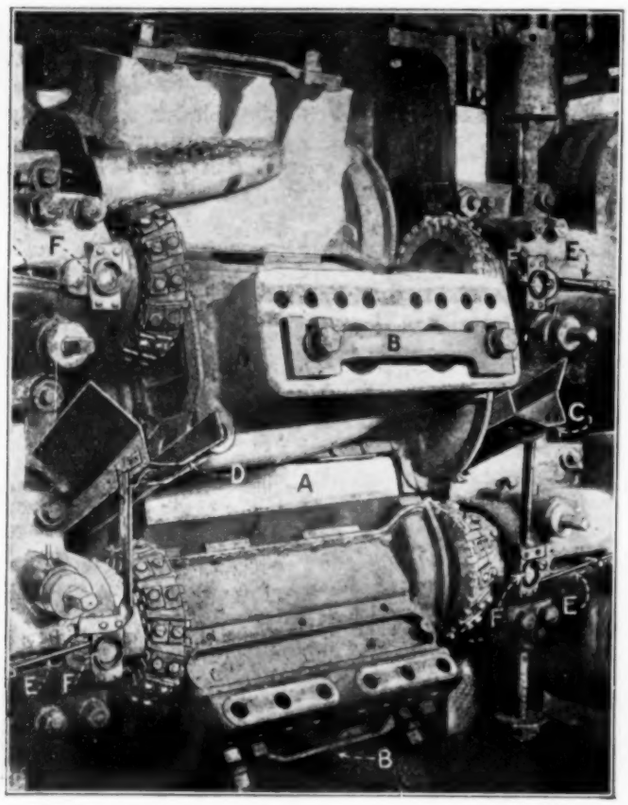


FIG. 4. MILLING BOTH ENDS ON CONTINUOUS MILLING MACHINE

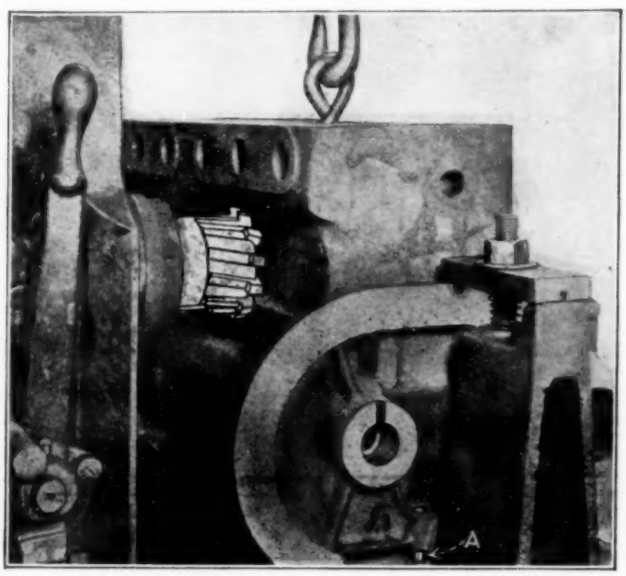


FIG. 5. MILLING THE SEAT FOR THE VALVE-COVER PLATE

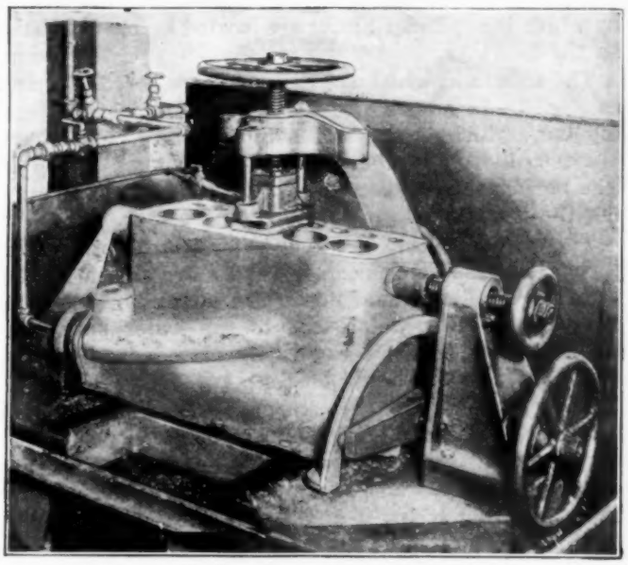


FIG. 7. THE FIXTURE FOR WATER TESTING THE CYLINDER BLOCK

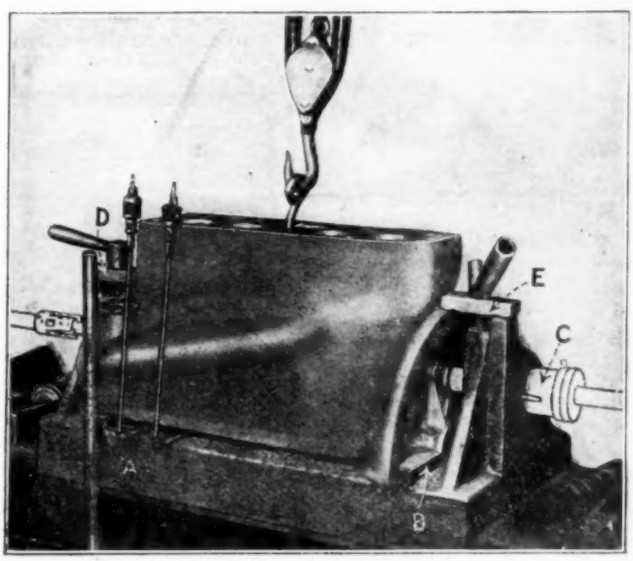


FIG. 8. BORING THE CAMSHAFT HOLE

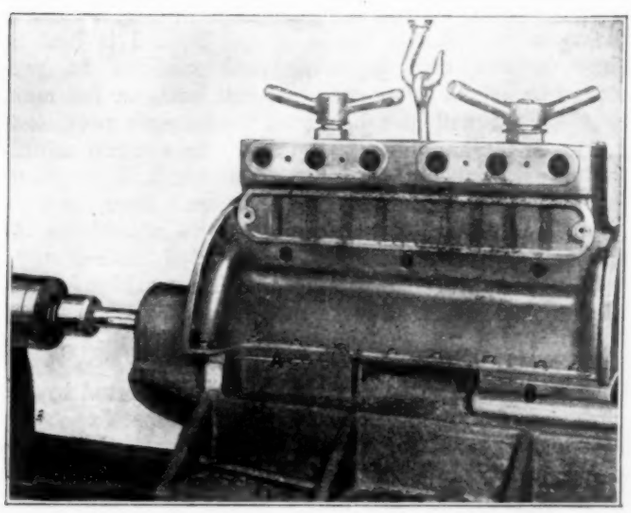


FIG. 9. BORING THE MAIN BEARINGS FOR BABBITTING

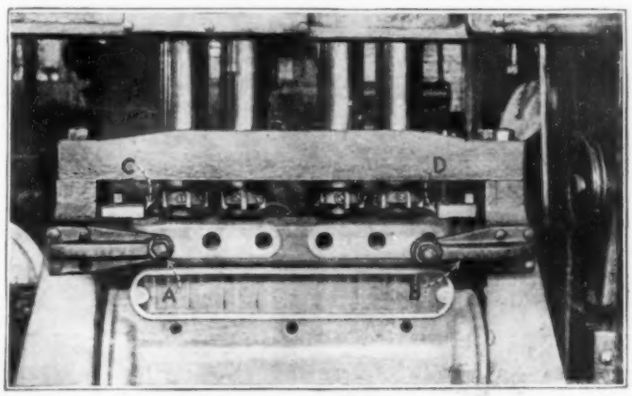


FIG. 6. BORING THE CYLINDERS

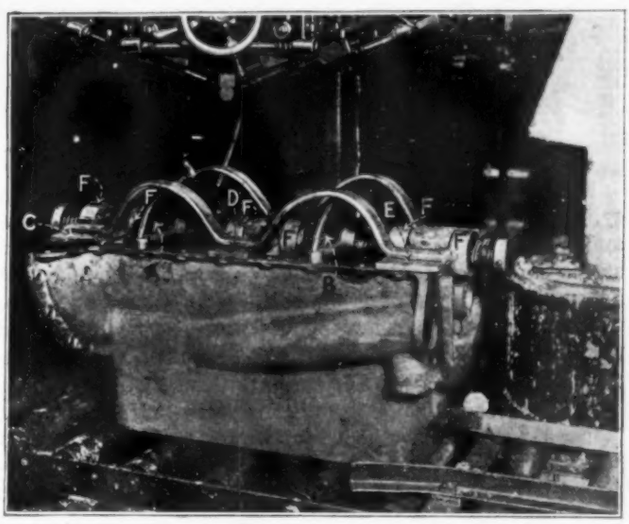


FIG. 10. FIXTURE FOR BABBITTING MAIN BEARINGS

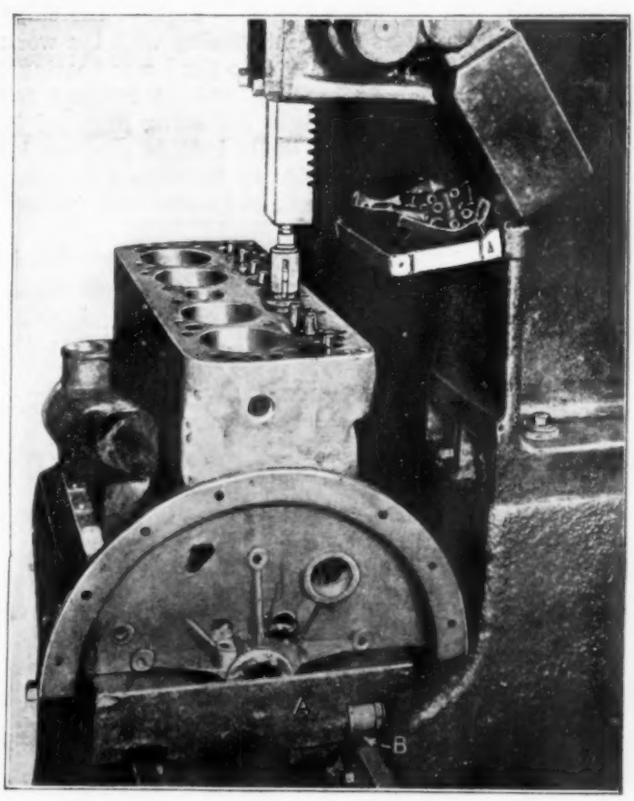


FIG. 11. FORCING END VALVE-STEM BUSHING

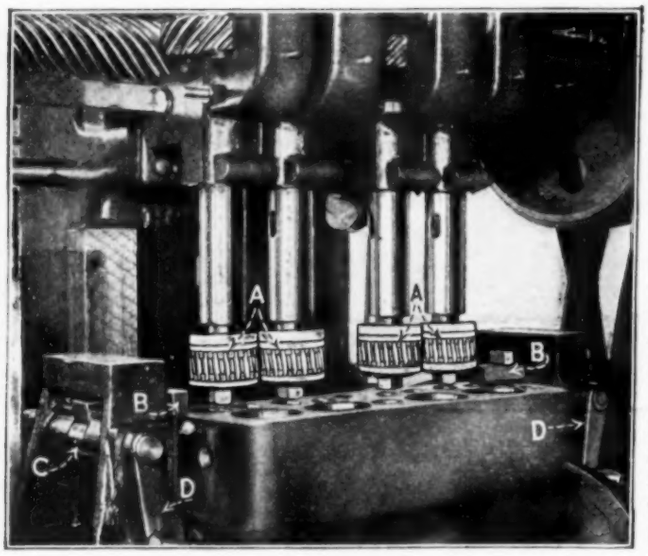


FIG. 12. BURNISHING THE CYLINDER

Next comes the milling of the top and sides of the cylinder block, these being placed in two rows, right and left hand, as shown in Fig. 3. The blocks rest on strips *A*, *B*, and *C;* are located by the reamed bolt holes, while the clamps *D* hold the cylinder block in place. A continuous milling machine has been ordered to handle this work, although the present machine handles 145 cylinder blocks in 8 hours.

A large continuous milling machine of a new type is used for milling the ends, which is the next operation. This is shown in Fig. 4 and is a four-spindle machine, the spindles being located on each side of a six-sided revolving table which carries the work. The work faces are shown at *A*, and the straps used for clamping at *BB*. Troughs *C* and *D* prevent the chips from the upper cutters from interfering with the work of the lower cutters or getting into the lower bearings. Provision is also made on each spindle housing for setting the cutters, setting bars *EE* being provided in each case. These bars are easily held in position by means of the slot in each side of the cups *FF*. This machine carries 11-in. cutters and handles 130 cylinder blocks in 8 hours.

The edges of the valve-stem pockets are next milled as shown in Fig. 5, this showing one of the dowels *A*

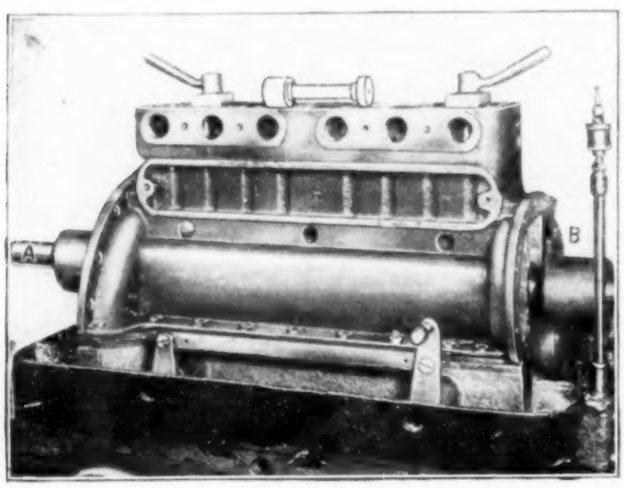


FIG. 13. BORING THE BABBITTED BEARINGS

by which the cylinder blocks are located by the bolt holes in the bearings.

The fixture in which the cylinders are bored is shown in Fig. 6. In addition to the heavy guide for the boring bars which is across the top of the fixture, there are the side stops *A* and *B* and the clamps *C* and *D*. The boring bars remain stationary and the table carrying the work is fed up to the boring cutter.

The cylinder blocks are now water tested for leaks in the jacket, this being done in the fixture shown in Fig. 7. Convenient arrangements are made for covering the various holes which lead to the water space, the three handles shown being easily operated. This fixture handles 300 cylinder blocks per day.

The cylinders are then reamed, the camshaft hole rough-drilled, and other drilling operations performed, after which two double-ended lathes finish-bore and ream the camshaft hole as shown in Fig. 8. This shows the supporting strips *A* and *B*, the substantial bushing *C* which maintains the boring bar in its proper position, and the two clamps *D* and *E*. The oil cups shown lubricate the bearing so as to prevent wear. These machines handle 225 cylinder blocks each in 8 hours.

After various drilling operations, which include anchor holes in some of the bearings, the main bearing

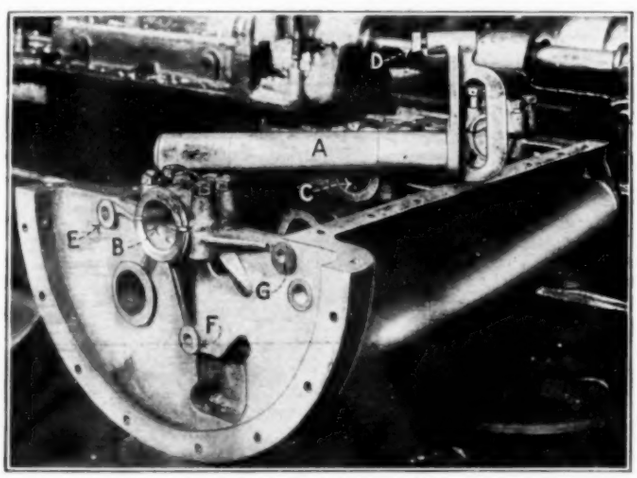


FIG. 14. TESTING THE MAGNET-COIL SUPPORTS

is rough-bored on the fixture shown in Fig. 9. Here the cylinder rests on blocks *A* and *B*, and is held in place by two clamps, being positioned as in previous operations by the reamed bolt holes in the main bearing. It will also be noted that ample provisions are made for handling the cylinder, the eye-bolt affording an easy opportunity for the hoisting hook to lift or lower the casting as the case may be. Here, as in a number of the other operations, Stellite is used for the cutting tools, this including the inserted teeth of milling cutters in some instances. The machine shown handles 150 cylinder blocks in 8 hours.

BABBITTING THE MAIN BEARINGS

The babbitting mandrel, Fig. 10, is supported by the rigid cross-members *A* and *B*, which have hand openings cast in them for easy handling. These rest on the bottom surface and also fit into bolt holes which locate the mandrel endwise. The side frames, which are curved to go over the cross-members *A* and *B*, carry the three pads *C*, *D* and *E*. These pads act as cheeks for the

mold and, together with the collars *FF*, confine the babbitt to its proper channels.

It will be noticed that there are springs around the mandrel between each collar and the supporting members. These allow it to be moved endwise in the bearing to aid in loosening it, should this be necessary. The tracks over the rollers guide the cylinder block as it moves to the next position. This furnace handles 450 per 8-hr. day. Back of the block being babbitted is an outline of the spindles of the special machine for drilling the anchor holes in the bearings.

The bearings are then trimmed by hand at the rate of 500 in 8 hours, after which they are filed at a somewhat higher rate and the main-bearing bolt holes tapped in a special 12-spindle tapping machine, each machine handling 360 per 8-hr. day.

Then the valve-stem bushings are pressed into place, as shown in Fig. 11, a substantial arbor press being used for this purpose and handling 300 in 8 hr. It will be noted that the work is mounted on the block *A* which rolls on the track shown, one of the rollers being shown at *B*. The holes are then reamed and the valve seats machined, the bolt bosses on the bottom flange spotfaced, and holes for various purposes tapped in the usual manner.

Then comes the finishing of the cylinder bores by burnishing, the four-spindle machine shown in Fig. 12 being used for this purpose, in a similar manner to that on the regular Ford motor. The burnishing tools

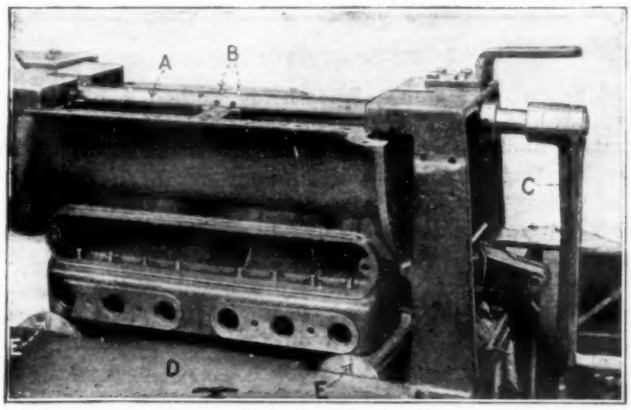


FIG. 15. CUTTING THE OIL GROOVES IN BABBITT BEARINGS

are shown at *AA*, these enlarging the diameter approximately one-thousandth of an inch, and producing a firm, hard surface which has excellent wearing qualities. The quick-acting clamps *BB* are operated by eccentrics, one of these being shown at *C*, the eccentrics being swung into position by the crank handles *DD*. The cylinder burnishing machine handles 450 blocks in 8 hours.

Next comes the drilling of the oil holes for the main bearings, the setting of washers and bolts, and the bolting on of the bearing caps, after which the bearings are bored in a lathe in the fixture shown in Fig. 13. This requires no detailed description, the oil cups for lubricating the bearings, the plug gages for the holes, and the mandrels which position the cylinder block with relation to the camshaft hole being shown at *A* and *B*. These insure the two bearings being parallel and at the correct center distance for the proper meshing of the timing gears. This machine handles 180 cylinder blocks per day.

Then the rear bearings and their caps are faced, and the rear-end flange turned for the magneto spool; after which the positions of the three bosses which support the spool are inspected with the gage shown in Fig. 14. Here the shaft *A* is pushed into the bearings *B* and *C*, and the gage turned so that the plunger *D* can gage the height of the bosses *E*, *F* and *G*. This is done at the rate of 360 in 8 hours.

After this the ends of the bearings are touched up, the core holes plugged, the valve seats finished, and a final water test given the whole cylinder block. The oil grooves are then cut in the main bearing in the fixture shown in Fig. 15, this being a hand-operated fixture carrying the bar *A*, and the grooving cutters *B*, and operated by the crank handle *C*. The cylinders are placed on the table *D*, slid into position under the fixture, and forced up against the overhanging end by the rollers *EE*. This makes a very simple fixture and one in which 900 cylinder blocks can be handled in an 8-hr. day. The oil grooves are then cut in the caps in a similar manner at the rate of 1800 in 8 hr., after which the caps are burred with a hand file and the cylinder block is ready for the assembling department.

Payroll Control

BY THOMAS J. WALSH
Factory Accountant, Garvin Machine Co.

Absolute accuracy, with a minimum of labor, is obtained from the following method of handling the payroll of a large machine-tool manufacturing plant. Job or unit time cards are used, but the plan may easily be adapted where a daily time card is used.

The controlling function of the method includes the proof of accuracy of the employees' wage extension on the payroll, and in addition the practical if not actual automatic checking of the rates and extensions on the time or cost card.

The common method of the past, and even of today, of making up payrolls has been to post the daily time of the employee, and after the week closed, for the payroll

FORM A

NO.	WEEKLY RATE	NAME	HOURLY RATE	DAILY RATE	SATURDAY RATE
1	60 00	J. J. Johnson	1 25	10 39	5 30
2	27 44	W. Reilly	59	5 02	2 34
3	33 02	M. Tobin	71	6 04	2 82
4	19 53	J. Wallace	42	3 57	1 68
5	42 32	W. Read	91	7 74	3 62
6	55 20	R. Walsh	1 15	10 06	4 90
7	17 28	D. Ryan	36	3 15	1 53
8					
9	22 56	R. Carroll	47	4 11	2 01
10	37 44	W. Devanney	78	6 83	3 29
11					
12	24 00	M. Canary	50	4 38	2 10
13	16 80	R. Pavela	35	3 06	1 50
14	15 84	A. Jackson	33	2 89	1 39
15	42 72	K. Bourne	89	7 79	3 77
16	419 15			75 58	36 25
17					

FIG. 1. WEEKLY RATE SHEET

clerk to cross-foot the time, extend the wages and add for proof, a very laborious and trying clerical proposition. All this can be accomplished just as well by simply observing the exception and not the rule, or in other words, tabbing the irregular employee and not the regular; it will be found that the employee who is late or absent, or works part of the day, or who works overtime is the one who causes the figuring of the daily payroll amount.

In order to explain the method, two forms *A* and *B* are shown in Figs. 1 and 2. Form *A* may be termed a rate sheet. On the one shown, several employees work on a basis of 46½ hr. per week and the rest on a 48-hr. basis.

As will be noted, hereon are shown the weekly extension, the hourly rate, the daily rate, or extension of 8¾ hr. at the hourly rate, and the Saturday rate or extension of 4¼ hr. at the hourly rate, minus three cents due for fractional adjustments in some cases. For example let us take workman No. 10, W. Devanney, whose hourly rate is 78 cents. His daily rate is 6.83 (8¾ × 78), his Saturday rate is 3.29 (4¼ × 78 = 3.32 — 0.03); his weekly rate is 37.44 (48 × 78).

For proof take five days at 6.83 = 34.15 + the Saturday rate of 3.29 = 37.44. The sheet is footed and proved by multiplying the total of daily rate by five and adding the Saturday rate which gives us the total for the week.

Before proceeding to explain the functions of form *B*, let me say right here that if none of these men on this sheet were late, absent or worked overtime, the payroll for the week is finished and no calculations, not even cross-addition of hours of each employee, is necessary as will be shown later.

Furthermore, this rate sheet is only affected by either changes in rate, employees leaving or employees being given the blank key numbers. The changes due to these causes are made in a few minutes as they usually affect but a few on each sheet.

This sheet is made up complete at the beginning of the week, and remains unaffected until the close of the week, when new men are rated and old men raised, which changes cause the adjustments on the rate sheet for the ensuing week.

A scrutiny of form *B* will show a composite idea of old and new payroll forms. But there the similarity ends. Note the absence of the daily time posting in the usual column. In its place will be found a few postings, late postings being in black, overtime and absence in red, and absence the entire day being denoted by an "X" in red.

Let us take the case of workman No. 14. He was reported late on Friday, 7.51 (7.45 being starting time),

FORM B

PAY ROLL FOR WEEK ENDING May 1, 1916

TOTAL AMOUNT	NO.	TOTAL HOURS	T.	F.	S.	M.	T.	W.	THUR.	FRI.	SAT.	MON.	TUES.	WED.	NEW MEN
60 00	1	X													
27 44	2	46½													
3.9 02	3	46½													
19 32	4	46			8¼	8¼					- 11	- 10			
42 32	5	46½													
55 20	6	X													
19 80	7	55	7¼	7¼	7¼ 4th	7¼	7¼	7¼	+ 18	+ 18	+1 62	+ 18	+ 18	+ 18	
22 56	8														
22 56	9	X													
37 44	10	X													
	11														
23 50	12	47					0 4						- 50		
16 71	13	47¾	7¼						- 09						
15 68	14	47½		7¼		7¼			-	- 08		- 08	-		
34 93	15	39½		X						-7 79					
407 92									+ 09	-7 69	+1 51	—	- 32	+ 18	75 67
									1 51	32					67 89
									18						37 76
									+1 78	-8 01					75 58
										+1 73					75 76
										-6 28					75 76
									75 67	67 89	37 76	75 58	75 76	75 76	407 92 6 28 414 15

FIG. 2. WEEKLY PAYROLL

and again on Monday, 7.54, being docked ¼ hr. each day. In the Friday column we find — 0.08 (minus eight cents), and the same thing in the Monday column. He has therefore lost half an hour or 16 cents from the weekly standard. To obtain the amount of his weekly pay, it is only necessary to deduct 16 cents from 15.84 as shown in form *A*.

Men regular or full time are denoted in the hours' column by an "X" in black which is equivalent to the weekly extension as shown on form *A*. The 46½-hr. total is shown so as to differentiate these men on that weekly basis.

Now as to the daily proof of cost extension on the job tickets and payroll: note the calculations in the Friday column; a plus of 18 cents (¼ hr. overtime) and minus 7.79 and 0.08, or a net minus of 7.69 for the day on this sheet. Referring to the footing of the daily rate on form *A*, we have 75.58, and deducting the minus of 7.69 we have 67.89 as the amount of cost extensions for this group of men for the day. If there is any disagreement it will be found right away, no matter whether it is an error in rate, extension, or time, or a missing job or cost card.

Where a job cost-card system is used, these cards are sorted according to workmen's numbers, run through an adding or tabulating machine in blocks of fifty for checking purposes and the payroll and production costs are thereby balanced.

In the lower right-hand corner of form *B* will be found a summary of the daily calculations which prove the weekly extension, together with a summary of the pluses and minuses which again furnishes proof of the figures on form *A*.

In conclusion it may be said that the only calculations necessary under this method are caused by irregularity.

The Swaging Machine and Toolroom Methods of Making the Dies

By W. E. THOMPSON

Toolroom methods for producing the dies used in the swaging machine, for reducing and shaping steel and other wires, are here described. When the swaging dies are needed in quantities, as where a battery of swaging machines are in constant service, mechanical aids to their rapid production have been devised.

SWAGING, or reducing the cross-sectional area of metal bars, wires, or tubes by means of dies carried in a rotating holder, and which are caused to reciprocate by rolls, or circular cams, is one of the best methods known for changing the size and form, but is one that is not thoroughly understood. It may be considered as a simple forging or kneading operation, the metal being drawn out in length as the diameter is decreased by quick hammer blows and squeezes.

A variety of cross-sections may be produced by this process, some of which are illustrated in Fig. 1. The simpler forms of reduction are those shown at *A*, *B* and *C* which are respectively: a reduction of round stock to a smaller round section, a square bar reduced to a round section, and a reduction of round tubing. These three examples are produced by using a head in which the dies can open to only a limited space.

At *D* and *E* are examples of reductions made in special heads, in which the dies are opened and closed

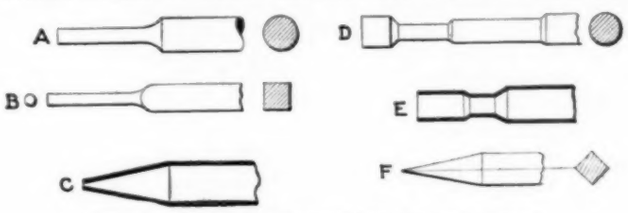


FIG. 1. SHAPES PRODUCED BY SWAGING

independently of the rolls by means of wedges or separate cams. At *F* is an example of a square bar reduced to a square point in a machine, in which the dies and the bar rotate together, and in which the bar is periodically removed from the dies and automatically indexed through a turn of 90 degrees.

The advantages of the swaging process over other methods are numerous and the most important of these are as follows: (1) The elimination of waste material or "scrap"; (2) the refining of the molecular structure by the forging and kneading action of the dies; (3) the high finish that may be obtained on the surface of the material; (4) a sharp point may be produced commercially having a hard, high finish; (5) gold-coated base metal may be reduced and the original relation of the thickness of the gold coating to the base-metal filling maintained; (6) a very high temper may be imparted to non-ferrous metals that cannot be hardened by heat treatment; (7) it is a practical method of forming tubing from a large to a small diameter; (8) the highest rate of production may be maintained.

A common type of swaging machine head is shown in Fig. 2. It consists of a cast-iron body *A*, into which is forced a hardened-steel ring *B*. The inside surface of the ring is ground concentric with the axis of the die head *C* after assembling. The die head is made of low-carbon steel and has a hardened U-section box *D* set in it. This box is ground and lapped in the groove to insure parallelism of the sides and bottom, and in it

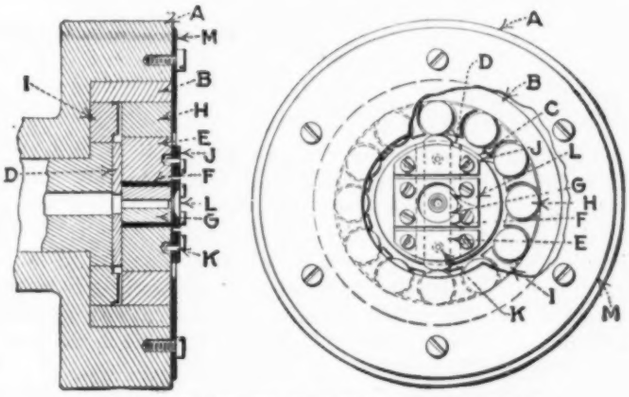


FIG. 2. DRAWING OF SWAGING MACHINE

slide the hammer blocks *E*, packing pieces *F*, and the dies *G*. These parts are hardened, ground and lapped to a sliding fit, and the packing pieces regulated so that the dies are firmly closed as they pass into diametral line with the hardened and ground rolls *H*. These rolls, which act as cams, are free to roll on the inner surface of the ring *B*, and are held in their relative positions by a roll cage *I*.

The amount that the dies open in this type of head is regulated by two plates *J*, each carrying a pin *K* which enters a hole in the die larger than itself. The plates are clamped by screws passing through elongated slots. They are set according to the class of work being operated upon by means of a standard gage consisting of a block of the proper thickness.

If the dies are allowed to open too far, especially pointing dies, the metal will be carried between them and the wear will be excessive; if they do not open far enough, the metal will not reduce.

The dies and packing plates are held in the die

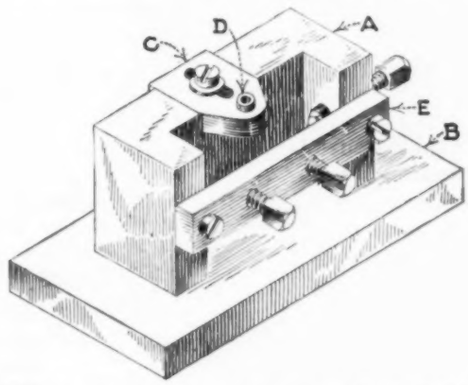


FIG. 3. DRILLING JIG FOR SWAGING DIES

slot by a plate *L*, and a plate *M* holds the rolls and oil. It is very essential that oil be used freely in all swaging operations, both on the work and in the head. Without oil to lubricate the surface of the reduced section, the dies will wear too rapidly and render the process very expensive. A stream of oil is used on all automatic machines and the work is dipped in oil when handling by hand.

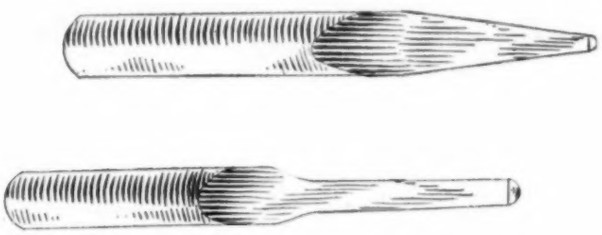


FIG. 4. TOOLS FOR FORMING IMPRESSION IN SWAGING DIES

The simplest method of handling parts to be reduced is to hold them in special pliers and introduce them into the dies by hand, but most machines have a work holder mounted on a slide that is operated either by hand or mechanically. The work holder is usually mounted with a spring between it and the slide to compensate for the sudden back pressure caused by the dies and it *must* be so mounted when the slide is mechanically operated.

The dies used in these heads must be made of the best grade of steel, as they are subjected to over 5000 blows per minute in some cases, and any defect in the steel due to its composition or heat-treatment reduces the life of the die enormously. Because of the speed with which the metal is shaped between these dies, the latter wear out, or change form, rapidly, especially when working on steel or german silver, and frequent replacement is necessary when the work is to be held within narrow limits of accuracy.

Practically all of the wear comes upon a small portion of the working surface, where the greatest reduction of the work takes place. This soon causes irregularity, or roughness on the surface of the work as well as a change in size, and to avoid machine delay, it is necessary to keep duplicate dies ready for service. It is the purpose of this article to describe the methods generally used to make these dies in quantities, and to repair them after they have worn beyond their limit of accuracy.

The die blanks, of various sizes, are machined into

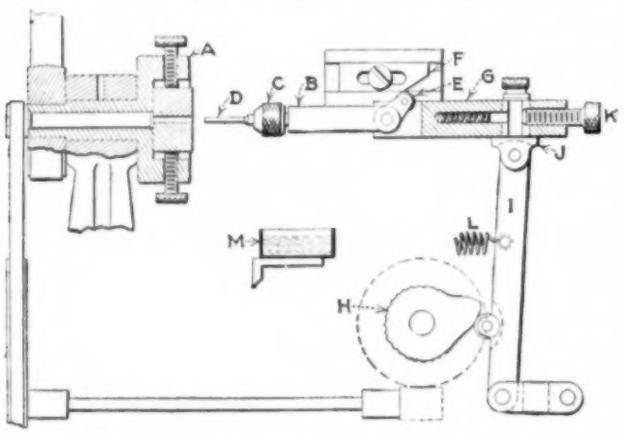


FIG. 5. DIAGRAM OF LAPPING MACHINE

blocks, leaving allowance for grinding all over, and are then annealed. Large dies may be relieved in the center of their side faces to reduce the grinding and lapping necessary after hardening. All dies not to be made into pointing dies should have a groove milled lengthwise through the exact center of their working surface, this groove being smaller than the finished form. Its object is to guide the drill used to enlarge the hole to its finished size. Dies to be finished by forcing a master form into them are left without this groove.

To produce a pair of master dies or original forms, the jig shown in Fig. 3 is used. This consists of a cast-iron box *A* attached to a base *B*, and supporting an adjustable bushing plate *C*. Bushings of various sizes, as at *D*, are made to interchange in this plate and are located in the center of the dies by lines on the plate and box. The dies are held in place in the box by screws both in the box itself and in the swinging arm *E*.

A pair of dies prepared as before mentioned are clamped in this jig and a drill slightly smaller than the smallest diameter of the reamer is passed through them. The bushing is then changed and a special reamer used to finish the form to size and shape. These reamers are usually made from drill rod as shown in Fig. 4 and, after heat-treating, are honed to a smooth cutting

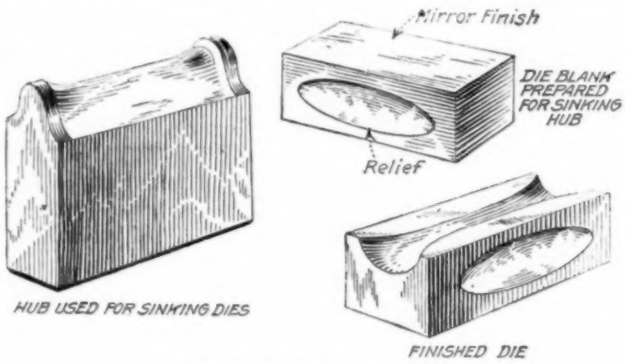


FIG. 6. SHAPES OF DIES

edge. The speed and feed used for reaming must be comparatively slow, as any grooves or imperfections in the formed surface will require an excessive amount of lapping to remove. After reaming, the hole is lapped to a smooth finish, using a copper lap of the same form as the reamer and a very fine abrasive. The dies are then ready for heat-treatment.

After hardening, the dies are ground all over as follows: The face that is nearest flat is set in contact with a magnetic chuck, and the opposite face ground to a surface; the die face is then ground parallel to the first finished surface, and the remaining faces ground square with the die face and to the proper side. The side faces are then lapped to a free sliding fit for the die-head slot in which they are to be used.

After they are finished on the outside they are clamped in a holder similar to Fig. 3, but having no bushing, and the form is lapped to the exact size and shape required on the work, using a very fine abrasive to finish with.

This final lapping usually consumes considerable time. It is done either in a drilling machine or the semi-automatic lapping machine shown diagrammatically in Fig. 5.

This lapping machine consists of a rotating die holder *A*, in which the dies are centered by means

of adjusting screws; a bell crank lever *B* carrying a chuck *C* for holding the lap *D;* and a cam roll *E* operating in connection with the cam *F*. This bell crank lever is pivoted on a slide *G*, the motion of which is controlled by the cam *H* and lever *I*.

The lever pivot *J* is adjustable by means of the screw *K*, and the spring *L* holds the lever *I* in contact

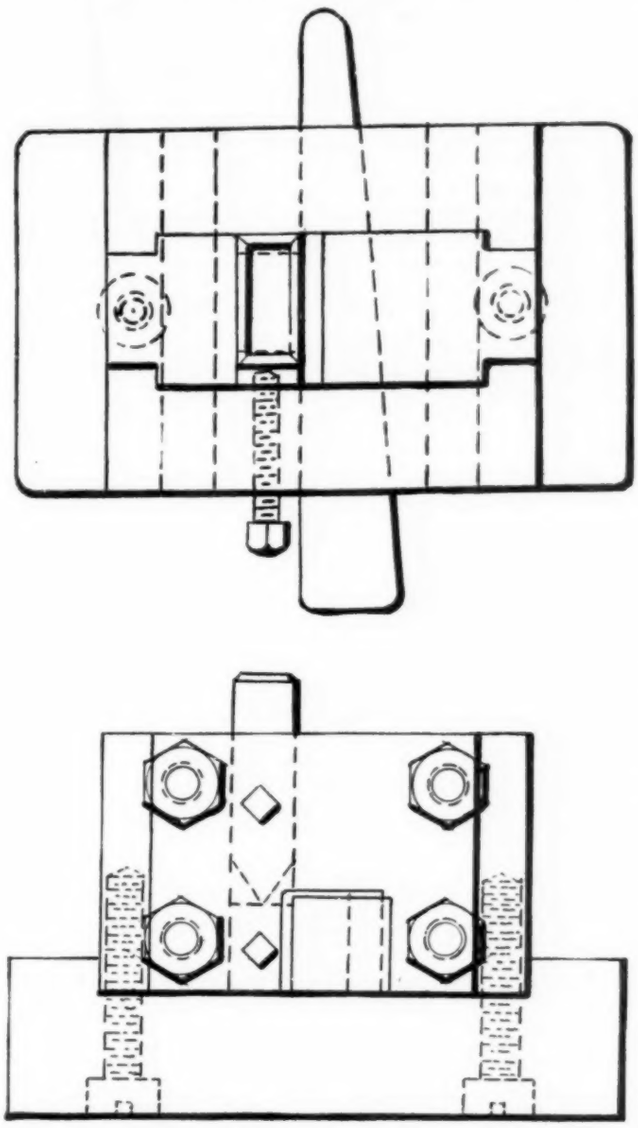


FIG. 7. FIXTURE TO HOLD DIES FOR HUBBING

with the cam *H* which is operated from the spindle through a worm and wormwheel. At the extreme rise of the movement, the lever *B* drops and the lap is momentarily immersed in a receptacle *M* containing oil and abrasive. The lap is reciprocated within the dies by a series of slight depressions in the cam, and the screw *K* is adjusted at intervals as found necessary.

Dies may be produced by the foregoing methods at a speed sufficient to keep a large battery of swaging machines in operation, but where large quantities of interchangeable dies are to be made the following process is more expeditious:

A pair of master dies are made by the process above described and tested in a swaging machine. One of these dies is used to produce a hub as shown in Fig. 6. The die and hub blank are clamped in the fixture shown in Fig. 7 and the hub blank pressed into the die form. It is then milled and finished by hand.

The process of making the dies is the reverse of the hub making. The hub is left longer than the die to obtain strength, and, after hardening, the form is highly polished and the outside ground true with the form.

The working face of the die blank must be highly polished before pressing the hub impression into it, as any scratch or depression in the surface is carried into the form by the hub, necessitating much lapping to get it out. The best method of getting a smooth, flat surface is to grind on a fine hard wheel, lap it with flour emery on a lap plate, and then obtain the mirror finish necessary for working gold-filled material by rubbing the surface of the die blank on a pine block charged with powdered sapphire.

Almost all steels have a tendency to change during heat-treatment and, when extreme accuracy is necessary, they must be lapped by hand to the correct size; but as the amount of material to be removed is very small, the time required to finish is but a small part of that needed to finish a reamed die.

Instructions to Toolmakers on Diemaking

BY M. J. ZIMMER

I am sending you a copy of instructions, one of three hundred that I had multigraphed while toolroom foreman for the International Time Recording Co. These were made up during the war when diemakers were scarce and we had to make our own.

Perhaps its best virtue was to teach each man what we thought was the best way to do the job; as you know, each man has his own thoughts and ways in diemaking and will go on in his own way, right or wrong, until taught differently.

The time and expense was small and I think this scheme could be worked out to advantage in many other shops where a uniform method of production is required.

Plane the punch, die, stripper, pad and get out the bolster for same. While machining operations are going on, study the blueprint for best possible way to lay out the die.

Grind and blue, punch and die, and lay out die. Next, drill dowel holes in die, but do not ream to size. Then transfer these holes on through into stripper and pad.

Drill out shape of die, being careful not to let holes run into each other. Put die, stripper and pad together, lining up with dowel holes previously drilled and using plugs made for this purpose. Now transfer all holes from die into pad, stripper and bottom bolster, and then take the pieces apart. This method has saved separate laying out of design to pad, stripper and bolster.

Ream dowel holes in die, and put in screw holes and any other holes necessary; open up holes for design until core is ready to drop out. File and finish shape of die; plug dowel holes and all other holes that are near edges. The die is now ready for hardening.

Before sending die to be hardened, lay stock for punch on die and trace outline with a sharp scriber. This will prevent you from being held up for work while die is being hardened, which will probably take a day or two. Send the die and specify the kind of steel with your order number to the hardening department.

Next place punch in shaping or other machine best adapted for machining same and try to work within 0.005 in. of line, all around. Should you finish this before receiving the die from hardening, you still have your pad and stripper which requires considerable drilling and the stripper will require machining to let stock through.

With a file, break all sharp corners on these pieces, also on bolster and punch holder.

Upon receiving die from hardening department, grind the top and bottom. The side of the die that is bellied most grind last; this will prevent rocking while grinding first side. If edges need grinding or squaring, do so, but do not put grinding or finishing where it is not needed, especially on parts that are not hardened as this runs up the time on the job and in no way helps the die to do good work.

By watching these points and planning your work ahead, you will save quite a few hours on your total time which will be a greater credit to you than a high polish which is soon lost when the die reaches the press room.

After grinding the die we are ready to shear the punch through. With the right amount for shearing all around (about 0.005 in.) the die, sharp, hard and a uniform clearance of about ½ deg. on a side, you should have no trouble in shearing the punch through. Examine every ½ in. or so to make sure the punch is going in square and that the chips are not choking the die, which might cause a bad break.

When your punch is through with the exception of about ¼ in., remove it and file off the remaining surplus chips and stock. This to prevent breaking off pieces of the punch.

If your die clearance is just right and you have left the proper amount of stock on punch for shearing and the cutting edge of the die has held up, you will have no difficulty in removing the punch from the die; often it will lift out with the fingers, but if conditions are otherwise the punch will drive out nearly as hard as it drove in and will have deep scars all over its surface.

If the punch has sheared well we are now ready to file the clearance. Let the blanking punch be smaller than the die as explained in the *American Machinist* Handbook, page 271. If allowing for piercing punches let the die be larger than the punch plus 0.001 in. for shrinkage or closing in of metal after punch is withdrawn.

If there is considerable stock to remove from punch for clearance, use a coarse pillar file No. 00 and finish with a No. 2 pillar file. If there is but little to remove, smooth punch with a No. 2 file.

Next, drill pilot holes, if any are required and do what other work is necessary; then harden punch all over and draw temper from back. This is best done in the lead pot as the back must be soft enough for riveting to prevent pulling through pad. Do not draw the temper from punch until ready for mounting in pad.

We are now at the point where our punch is hardened. Grind top and bottom. Lap the dowel holes in the die until a good fit for a drive fit reamer.

Line the stripper up with the dowel holes in the die and clamp both pieces together firmly. You will remember that the dowel holes in the pad and stripper have not been reamed as yet, only drilled. This for shrinkage or expansion that may have taken place in hardening of die.

Now ream through the die and stripper, unclamp and do likewise to the pad. Next, clean all parts thoroughly with gasoline, and dry them.

Place the stripper and die together the way they should go and drive in the dowel pins to line them up. Place the back of the punch up through the die from the bottom, and place the whole under the shearing press and give one or two good blows.

Remove the parts and do what filing is necessary to the stripper and then shear the punch through. File the stripper again to make the punch an easy fit unless the punch is slender and requires support from the stripper.

Do same to the pad with the exception of the final filing. The punch must be a good fit in the pad and stand square. Bevel the opening in the pad to suit the headed over portion of the back of the punch.

We can now draw the back of the punch and head it over and drive it in the pad. After this, grind the back of the punch and pad together until they are flush. If there now remains more punches to locate in pad, say piercing punches, proceed thus: Clean parts and place the die with two small parallels, about one-quarter square between. Centralize the punch in the die with small strips of tin or paper between punch and opening in die. Clamp together and spot through piercing holes in die with drill that is a good fit in holes. Remove the die and enlarge holes to size required for piercing punches. Insert punches and now try in die for line up; if all right, mount die on bolster and screw it fast, but do not ream for dowel holes until the last thing.

Now mount punch pad and screw fast. If punches line up with the die, ream and dowel the die, remove and place on stripper, the stop arrangement having been decided on, and machining completed. Screw and dowel die, stripper and bolster together.

Line up again and if satisfactory ream and dowel pad, again lining up, which will prove O. K. if care has been maintained.

Make sure of your part and tool numbers and stamp them in a conspicuous place; and with a few finishing touches such as breaking sharp corners, etc., the die should be complete ready for the inspector.

The foregoing directions if carefully followed will help you in completing a blanking die within a reasonable time, and time as you know is one of the important items considered before an increase in your rate is turned in.

The rules as given are not iron-clad and may be changed to suit conditions. The author had in mind an average man and an average job when he wrote them.

What's in a Name?

By E. M. Long

On page 816, vol. 51, of the *American Machinist*, there appeared some comments by Sandy Copeland on the names of things in the machine shop. I think his position is poorly taken, as can be proved by his own statements regarding spiral gears.

Accepting his definition of spiral, he is mistaken in saying there is no such thing as spiral gearing. One of my earliest recollections of gearing included a crown gear having a single spiral tooth and was used in a tallying mechanism. Later, the Warner Speedometer Co. used a crown gear having a number of teeth arranged in a spiral form.

He is also in error in limiting his definition of "spiral" to the clock-spring form. The New Standard Dictionary, one of the best authorities in the country on the meaning of words, says that a spiral, in form, may be cylindrical, conical, Archimedean or logarithmic, and one definition of spiral is "helical." Also the definition of spiral gear is one having teeth arranged spirally or worm-fashion around its circumference.

By the way, I would like to know what is the accepted dividing line between a worm (when used in gearing) and a helical gear? I believe that a single-thread worm is truly a one-tooth helical or spiral gear, but for convenience in making ourselves understood, we call it a worm. How many threads can it have before it becomes a spiral gear? Personally, I have drawn the line between three and four. Perhaps it should be between four and five. I should like to know what is the accepted usage.

Also, I would like to ask why our manufacturers of lathe mandrels do not place upon them some universally accepted mark showing which is the small end. Time and again have I tried first one end and then the other in the effort to drive or force a mandrel out of the work, and I know that I am not alone in this experience. It would also be a convenience in placing the mandrel in the work. It seems to me that a large letter S stamped on the small end of the mandrel would be a good way of overcoming this annoyance. The manufacturer who first does something of this kind will win the thanks of thousands of mandrel users.

Industrial Motor Control—II

By C. W. STARKER

Are you satisfied with your present system of motor control? Perhaps you will find suggestions for bettering your present installation in the many types of automatic direct-current motor controls covered in this article.

(Part I was printed on page 195, Jan. 22 issue.)

THE three classes of controllers previously described have in common the characteristic of being manually operated. The second and particularly important group of controllers is known as automatically operated, or magnetic controllers. This group has two subdivisions, semi-automatic and full-magnetic.

Direct-Current Self-Starters

The simplest form of automatic starter is a single-pole magnet switch, Fig. 11, which is obtainable in sizes from 500 to 4000 amp. The switch is closed by the pull of a magnet which requires only a small amount of current flow, while ¼ to ½ amp. is usually sufficient to hold the switch in the closed position. These switches are particularly suited for remote control where it is desired to control a heavy current from a distance, and where it would be too expensive to run the main leads to a remote point. Magnet switches may be operated by any kind of single-pole switch or by a set of push buttons, Fig. 12, having one button for the "on" and the other for the "off" position. A desirable feature of this switch is the "safe" button. This button may be turned into such position that it is impossible to start the motor from any other station until the button is turned back to the "on" position. In order to prevent burning of the contact, arc shields and magnetic blowouts are provided for all sizes. These switches are also manufactured as double-pole magnet switches which cut out both sides of the circuit.

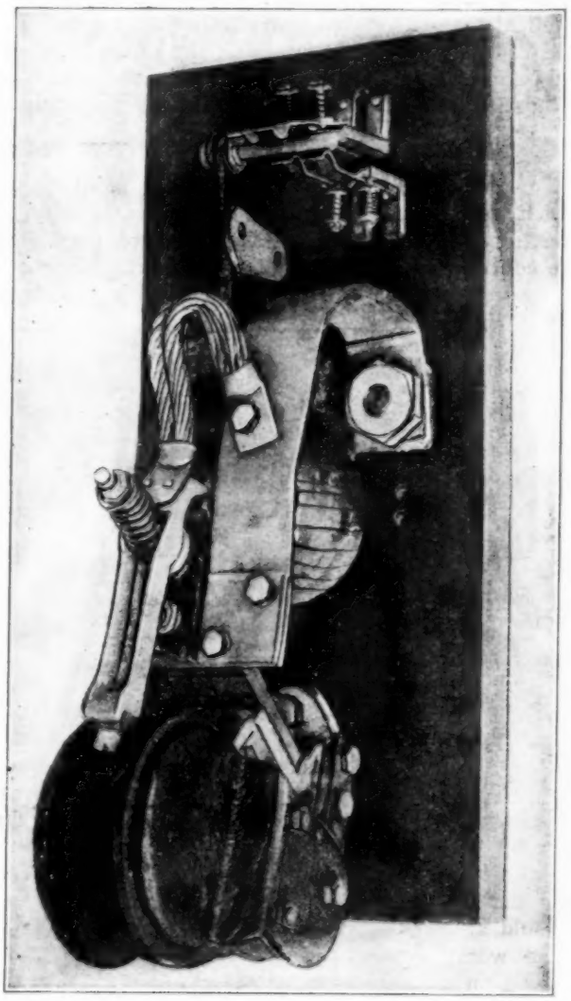


FIG. 11. SINGLE-POLE MAGNET SWITCH FOR REMOTE CONTROL OF LIGHTING AND POWER CIRCUITS

It is frequently desired to have the acceleration of the motor take place in a certain predetermined time, and to meet this requirement, time-limit self-starters are available in which the rate of acceleration is controlled by an oil or air dashpot. Such a starter is shown in Fig. 13. In operation the oil or air passes through small openings and, by varying the size of the opening, the time of acceleration can be adjusted to suit load conditions. This form of control is very generally applied to pumps, fans, compressors, elevators, etc. If remote control is desired, the switch can be operated by a knife or push-button switch, or by such special devices as float switches for oil or water tanks, or by diaphragm or pressure regulators on air, gas or fluid systems. It is often desired to employ self-starters in connection with small motors of ¼ to 2 hp., and for this purpose counter-electromotive-force self-starters, Fig. 14, are used. In these the starting resistance is automatically cut out in a single step by the action of the solenoid when the motor has attained approximately one-half normal speed; that is, they are operated, as the name implies, by the counter-electromotive force, the amount of which is proportional to the speed of the motor.

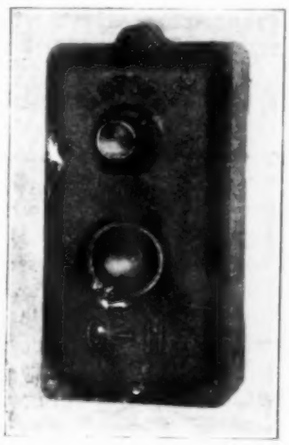
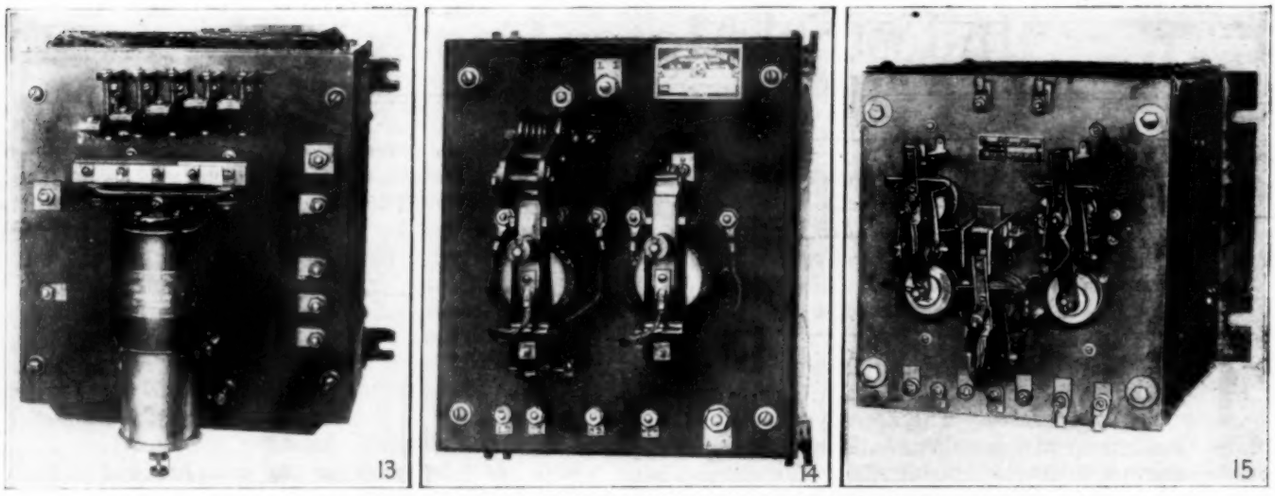


FIG. 12. A PUSH-BUTTON CONTROL STATION FOR SELF-STARTING SPEED REGULATORS

Another type of magnetic starter is based upon the automatic cutting out of resistance in steps by using a series of clapper-type switches with series coils. This is done in such a way that each accelerating switch is magnetically prevented from closing until the motor current has fallen to a certain predetermined value. This type of starter, known as the magnetic lockout self-starter, Fig. 15, is frequently employed for automatic remote control of motors for heavy-duty service on large pumps, fans, compressors, machine tools and other heavy machinery. They may be equipped with magnetic blowouts, magnetic main switch, overload release, knife switch and fuses, mounted on a panel



FIGS. 13, 14 AND 15. SEMI-MAGNETIC CONTROL SWITCHES
Fig. 13—A time-limit self-starter. Fig. 14—Counter-current controlled starter. Fig. 15—A magnetic lockout self-starter

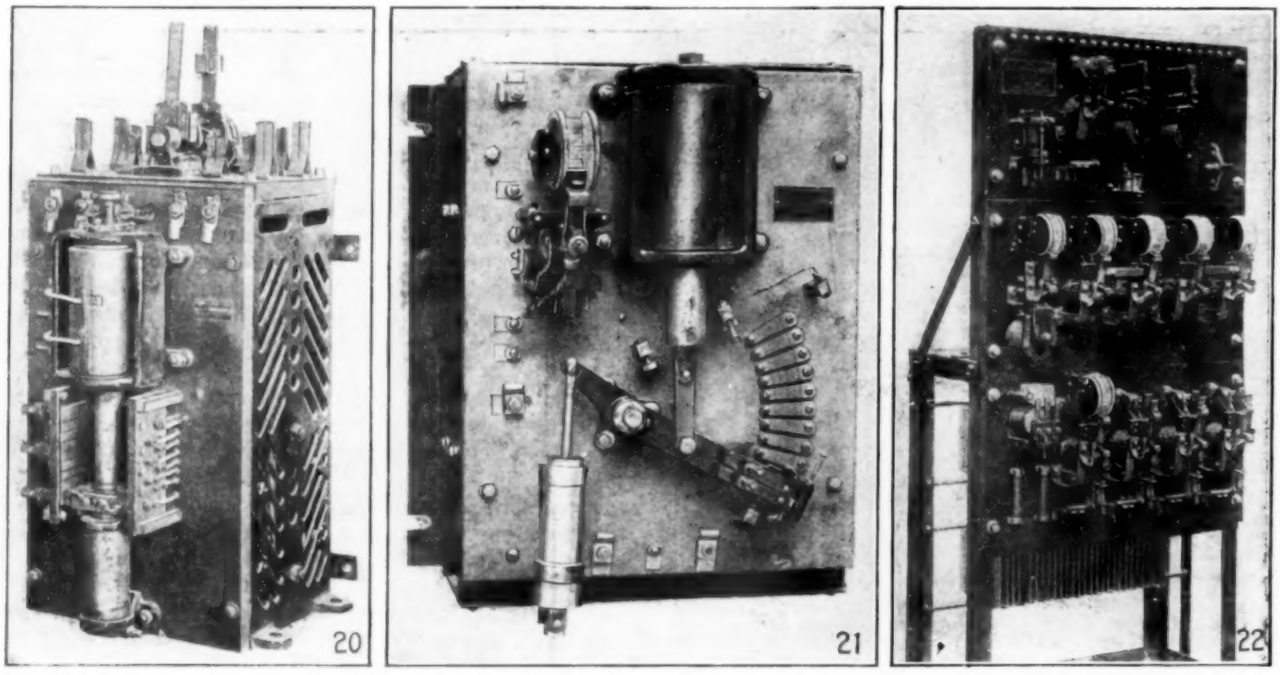
as one complete unit. Modifications are obtainable where the control is to be installed in connection with mine and fire pumps or mine fans where wide fluctuations in line voltage may occur and where the starters are located in damp places.

According to their functions, automatic machine-tool controllers may be divided into three groups, namely: controllers for plain starting, controllers with speed settings and controllers with speed-regulating features. The first-mentioned type is used in connection with constant-speed motors, and may be non-reversing—for starting and stopping only—or for reversing service. A controller combining all of these features is shown in Fig. 16 installed on an engine lathe. The handwheel for operating the controller is within reach of the operator at all times, and with installations of this type, there is no danger of any one accidentally coming in contact with current-carrying sparks.

An interesting control for machine-tool operation is shown in Figs. 17 and 18. Here a semi-mechanical reversing starter is connected to the stops on the platen of a planing machine. The motor is automatically reversed at the end of each stroke, and brought up to a predetermined speed before entering the cut. Push-button controls are placed at different points on the machine so that the starting or stopping of the motor is at the finger tips of the operator. Dynamic or electro-mechanical brakes should always be a part of such equipment. In case of current failure, the brake is automatically applied to bring the motor and machine to a quick standstill, preventing serious damage to the equipment.

Control for Machines Used in Printing Plants

For the control of machines used in printing plants which require motors of 1- to 3-hp. capacity, self-starting speed regulators, Fig. 19, are used. They are controlled by either a double-pole main-line switch or by push buttons. The closing of this switch ener-



FIGS. 20, 21 AND 22. TYPES OF ELEVATOR CONTROLLERS
Fig. 20—Semi-mechanical, direct-current elevator controller. Fig. 21—Pivoted-arm type of semi-magnetic controller. Fig. 22—Full-magnetic controller for high-speed elevator

gizes a solenoid, the plunger of which is attached to a contact arm, and, by means of the latter, resistance is cut out step by step. Five to 10 steps are usually provided, and a speed regulation of 50 per cent by armature control and from 20 to 100 per cent by field control is obtainable commercially. The usual electro-mechanical braking features may also be added.

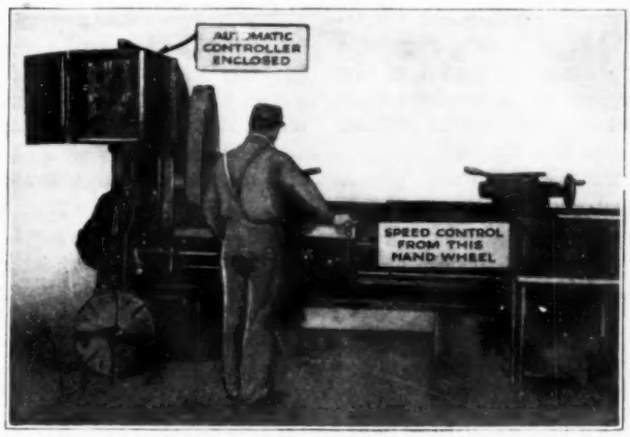


FIG. 16. TYPICAL AUTOMATIC CONTROLLER APPLIED TO A LATHE

With automatic machine-tool controllers, there are a number of special points which should be brought out. The use of magnetic lockout switches makes the controller very simple both electrically and mechanically, and series relays, protecting resistors, etc. are thereby eliminated. In order to insure that the last contact remains closed during fluctuations of line voltage, or strengthening of motor fields, a shunt coil is used. Speed-setting controllers are provided with accelerating relays which insure that the motor always starts under full field and, after the armature resistance is all out, automatically accelerate the motor to the speed to which the field rheostat is set. Speed-regulating controllers have two relays, one for acceleration and one for deceleration. The accelerating relay serves to limit the rate of field weakening, while the decelerating relay prevents too rapid strengthening of the motor field when stopping or reducing speed from the master controller; thus excessive dynamic braking currents or return surges of current from the motor to the line are avoided. In drum-type controllers, arc barriers should be used between the contact fingers, and, in the higher capacities, magnetic blowouts should be added. The low-voltage protection should, with all machine-tool controllers, be so arranged that the motor will not start upon return voltage until the operator desires. The importance of the foregoing statement cannot be too strongly emphasized. To start a motor after a current failure, it will be necessary to press the "run" button if the controller is operated from a push-button switch; or, if operated from a master-drum controller, the handle must first be turned to the "off" position, and then moved to a starting position.

The control of elevator motors is a particularly interesting branch of industrial motor control. The field is very large and rather specialized, so that only a few main points of broader interest to machine-shop men will be briefly touched upon. Elevator motors are divided into three classes according to the service: slow-speed freight elevators, moderate-speed passenger elevators, and high-speed passenger elevators. The control equipment naturally follows these divisions, and in additions has the two subdivisions, semi-magnetic and full-magnetic control, operation of the controller in all cases being by car switch, push button or rope.

A simple semi-mechanical elevator controller built in capacities of from 5 to 25 hp. and intended for slow-speed service is shown in Fig. 20. It has a reversing switch mounted on a control panel which carries a solenoid operating rheostat. Its operation is as follows: By means of a wheel, rope or lever, the reverse switch is thrown into the running position, the solenoid is energized, and the plunger with contact fingers travels

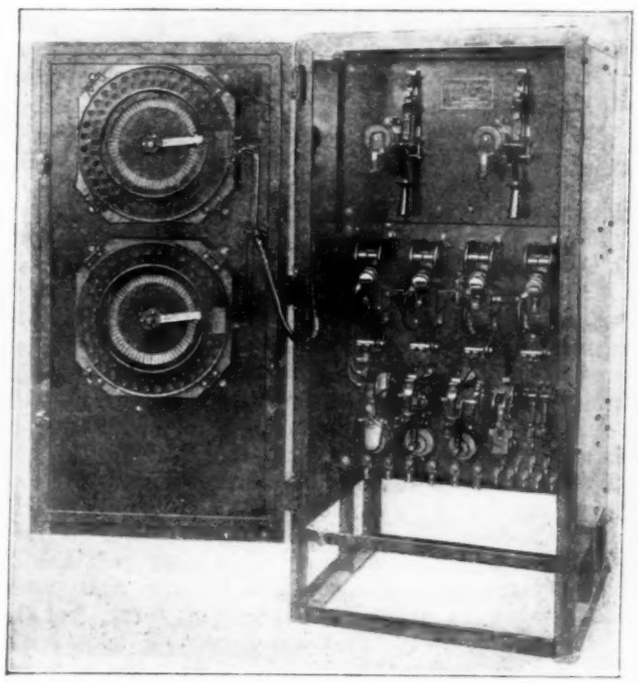


FIG. 17. SEMI-MECHANICAL CONTROLLER FOR A PLANING MACHINE

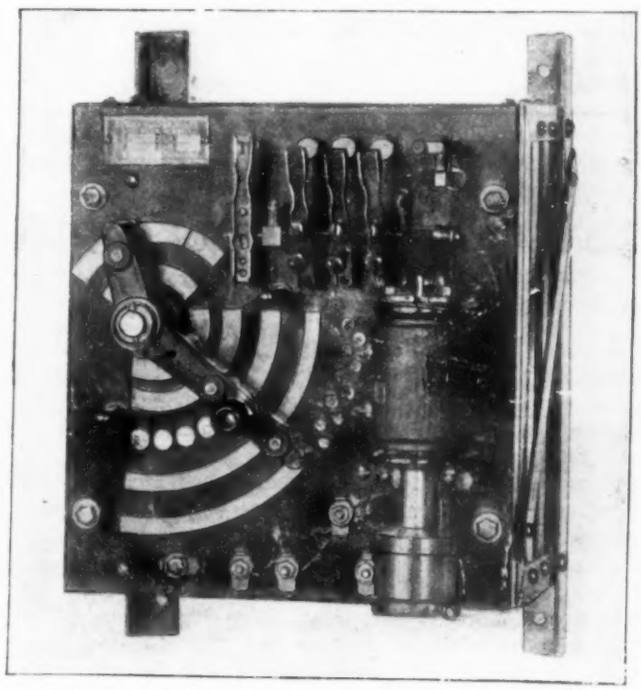


FIG. 19. SELF-STARTING SPEED REGULATOR FOR PRINTING PRESS

upward over the stationary contacts, cutting out resistance in doing so. An air dashpot, as shown, regulates the time consumed, and at the limits of travel of the elevator a traveling nut is arranged to throw the switch to the "off" position. The contact arm may be pivoted to swing in a circle, as shown in Fig. 21, the operation of this type of controller being similar to the one just described.

These controllers are typical for a slow-speed service, while the full-magnet type of elevator controller, shown in Fig. 22 is intended for high-speed, passenger-elevator service at 350 ft. per minute car speed or less, and is operated by a switch mounted in the elevator car. Acceleration to normal speed is governed by series relays in the armature circuit and above normal to high-speed acceleration is governed by magnetic-field-weakening switches with a series relay in the shunt-field circuit. Overload protection, dynamic braking and slow-down features are also provided. The slow-down speed obtainable is about 30 per cent of normal speed.

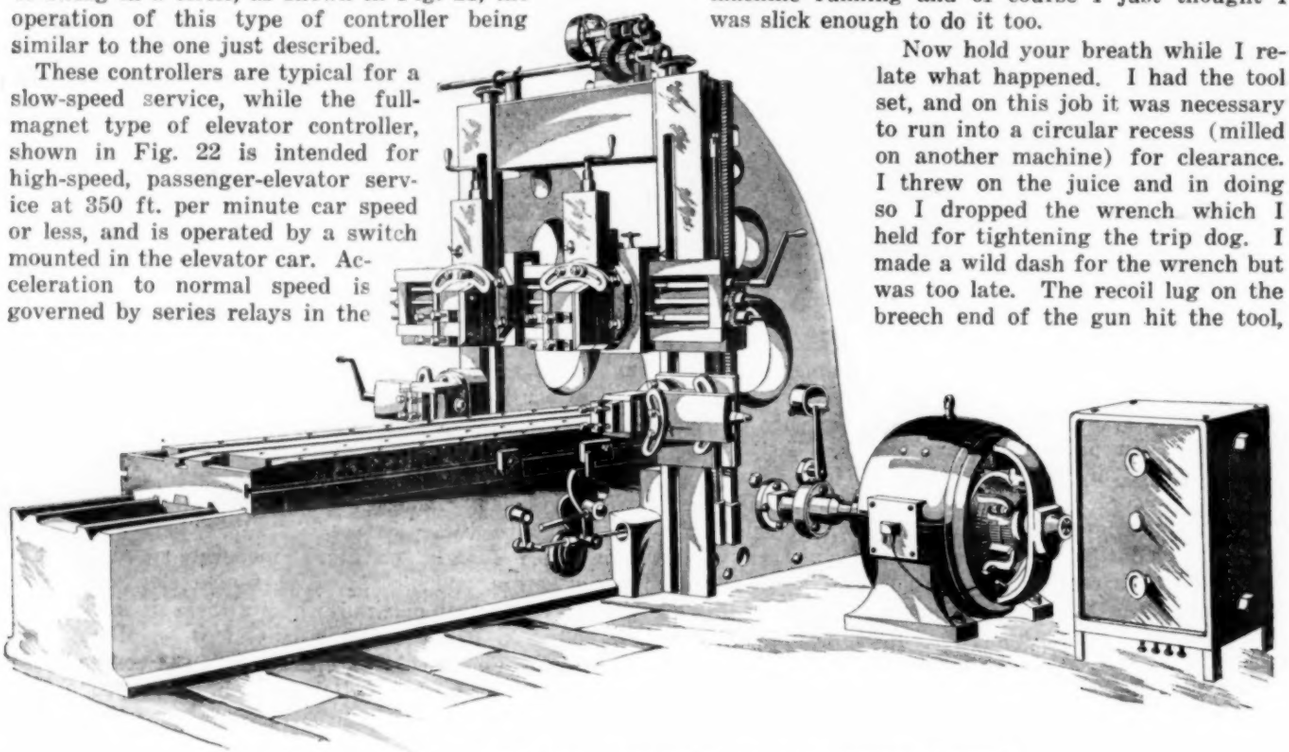


FIG. 18. THE CONTROLLER ATTACHED TO A PLANING MACHINE

The push-button control is especially adaptable for foundries or shops where there are two or more landings, and eliminates the necessity of an attendant. The car is started and automatically stopped by simply pressing a series of button switches located at the different landings.

Rules of Etiquette To Be Observed in the Machine Shop

By H. L. Wheeler

I would like to inform Charles Eldridge, who writes upon the above subject on page 1048, Vol. 51, that I once performed the impossible stunt of running the platen of a planing machine on to the floor.

It happened this way:

It was at the time when I was, what Mr. Eldridge would call a junior machinist, in one of the Government arsenals. The machine was a large motor-driven planing machine with three speeds, accelerated reverse, and all the other up-to-date trimmings that went with a big planing machine at that time. The job was a 4.7-in. field gun mounted on centers and the operation consisted of planing the outer contour of the gun to a templet layout.

One or two other apprentices on the job before me had made good and passed along to something else, so it was now my turn. I had good luck with the first gun and got it off all right and had mounted my second. I had many times seen a man setting the trip dogs with the machine running and of course I just thought I was slick enough to do it too.

Now hold your breath while I relate what happened. I had the tool set, and on this job it was necessary to run into a circular recess (milled on another machine) for clearance. I threw on the juice and in doing so I dropped the wrench which I held for tightening the trip dog. I made a wild dash for the wrench but was too late. The recoil lug on the breech end of the gun hit the tool, which was of Novo steel and about $\frac{7}{8}$ x $1\frac{1}{2}$ in. section, and snapped it off like a pipe stem while the toolpost and slide were torn from the crossrail. Believe me, there was some fireworks for a few minutes.

I jammed on the reverse and that platen sailed by me like the Chicago limited. This all happened in a very few seconds, and by the time the platen hit the floor I was sweating along the spine as though I had been struck with the palsy. I just let her rip; that's about all I could do, or knew what to do, probably on account of my inexperience. The platen, however, positively did hit the floor. When I woke up, I was before a military tribunal consisting of a lieutenant-colonel, a major, a captain and several lieutenants, all doing their bit for the Government.

If Mr. Eldridge or any one else doubts my statements, please be informed that somewhere in the musty archives of the War Department in Washington can be found a full and complete report of the event, signed, countersigned, and decorated with all various brands of red tape and signed and sworn to by me, with several affidavits and witnesses.

I tried to prove an alibi, but the evidence is strong against me that I once performed the "impossible." I was excused on the grounds of ignorance, youthful appearance and inexperience. This happened about sixteen years ago. I have since traveled some and have worked in a goodly number of shops, but I have never heard of the thing happening to anyone else. I might add that I believe it to be a very rare occurrence.

U. S. Government Sales and Belgian Machine Tool Conditions

By ALEXANDER LUCHARS

This is the concluding article of the series on conditions in the machine-tool and kindred industries in Europe. It was written in Brussels on Aug. 15, and considerable of the information it contains has now lost it value, but it may be of some interest to manufacturers whose products are sold in Belgium. In this article will be found a summary of preceding articles on Great Britain, France, Italy, Switzerland, Holland, Germany and Scandinavia, and a comparison of labor and material costs.

A MATTER of great importance to American machine-tool manufacturers is the amount and effect of sales of tools by the United States War Department in Belgium. As our manufacturers already know, these are being sold at 1914 prices plus 55 per cent. c.i.f. Antwerp; the 55 per cent. being figured not only on the 1914 cost of the tools, but on the freight and other costs. Three years' time is given the buyers by the Belgian government, and this item in the terms is perhaps more attractive to the buyers than the low price. A discount of 10 per cent. is given for each year a tool has been in use, unless it has been used so little that its value has not been affected.

Under the arrangement made, the U. S. War Department sells these tools to the Belgian government, which markets them through *La Construction Metallique*, a coöperative society organized to do business without profit, and composed of Belgian manufacturers in the machinery and metal manufacturing industries, any one of whom may become a member by paying a small fee. Any member of *La Construction Metallique* may buy any number of these machines on the above terms, without regard to whether or not they are to replace machines stolen by the Germans. *La Construction Metallique* includes 18 subsidiary groups of manufacturers, among them makers of automobiles, locomotives, machine tools, motors, engines, etc. The original arrangement for financing these sales was based on a credit of $22,000,000 granted to the Belgian government by ours; $3,000,000 worth of machine tools were sold, and it was then found that the $22,000,000 credit had been used by the Belgian authorities without reserving any of it to pay for the tools. After some delay a second arrangement was made which is now in force, under which the tools are to be paid for from the $50,000,000 Belgian credit recently negotiated with American banking institutions.

About $3,000,000 worth of machine tools have already been sold, and it was stated by an officer in authority that it was expected to sell about as much more—in all, about 4000 machines. The selling of small tools is now being considered. No accurate list of tools owned by our Government is in possession of the U. S. officers in Brussels, nor of the Director of Sales, C. W. Hare, whose office is in Paris. Mr. Hare controls the sales of all our surplus war material, and has several efficient assistants who are in direct charge of the sale of tools in Belgium. Under the present arrangement a Belgian manufacturer places his order for various machines without knowing, apparently, whether or not our War Department has them in stock. If it has not, then he is expected to take some other size or make, subject perhaps to a price adjustment up or down. This might work out if only a few machines were sold, but with 4000 there can hardly fail to be trouble with deliveries and settlements, and whoever has this to handle is not to be envied. The sales are made in dollars by the U. S. War Department; and the prices at which the machines are bought by Belgian manufacturers are presumably subject to the fluctuations of exchange, unless a heavy loss is to be made up somewhere.

One of the officials in charge of these sales advanced the following reasons in support of them: (1) That the tools had to be sold *somewhere*, and that they would probably do more good in Belgium than elsewhere and would also keep the Germans from selling a considerable part of the amount; (2) that the Belgians need tools badly to reëquip their factories, and have not the money to buy them on ordinary terms of payment; (3) that many Belgian manufacturers are buying American tools who never had one in their shops before, and this sale should make a future market for them which will be worth some transient loss. Of course I handed out some good machine-tool-manufacturers' answers to these statements; but as you all know about what you would say, I will take up no space for repetition work.

The Belgian machine-tool dealers are not considering the proposition from any philanthropic standpoint. They say that the prospective enormous Belgian demand has almost disappeared, because manufacturers are waiting to see how much of their equipment they can get from Uncle Sam. One dealer told me that for this reason an order amounting to 300,000 francs, with prospects of a further increase to a million, was canceled. Another dealer says that machines sold by the United States Government are being bought only by those who have had considerable experience in the past with American tools and know them well. The medium-sized and small plants that have been the largest buyers of German machines heretofore have not so far bought any American tools and appear to be waiting until they can again buy in Germany. In spite of this heavy load on the market, a fair business is being done in American tools at current prices, showing that except for this sale a splendid business would be going on.

After investigation there seems to be no doubt that receipts were in most cases given by the Germans for the machine tools and other machinery stolen from Belgian works, and that the tools were also tagged or otherwise marked to facilitate identification. It is also true that an effort is being made by the German authorities to collect and return these machines. Mr. Rother, one of the staff of Schuchardt & Schutte in Berlin, is in charge of the return of these machine tools. But restitution is not easy.

It is stated on good authority that only about one-

fifth of the machine tools taken away have been returned. The Cockwill Works, from which some 3500 were taken, have had about 300 returned. The Minerva Works, which lost a large number, have got back almost none. One large press was returned to them, but the cost of getting it back, replacing some of the parts and reërecting it, left but a small part of its original value. The large works can afford to send people out to search for their machines and see that they are returned, but this is too expensive for a small concern, and if the machines are found they may be worn out. Many Belgian manufacturers are not trying to get their machines back, apparently expecting to buy new ones through *La Construction Metallique* or some other source. There is no special fund to reimburse these manufacturers for money spent for reparations. They will have to await the distribution of the indemnity, probably a process of years. There is nothing in the statements that some of the Belgian tools had been repaired and resold by the Germans.

All the important Belgian works are said to have placed large orders for machine tools—some in the United States and some in Scandinavia. I heard of none being placed in Germany, but some people say that if the difference in price continues it is only a question of time before machines will be bought there. It requires quite a lot of patriotism to keep turning down prices from 25 per cent. to 50 per cent. less than are being paid; but the Belgians will do it for a time.

Some machine-tool makers are getting ready for business, but no important concerns. The report that the big Fabrique Nationale, at Herstal, intends to make machine tools appears to have started from their decision to make some special tools for their own use. There some 4500 to 5000 machines were stolen by the Germans and but a few have been returned. Only about 2000 hands are now employed there.

Labor

The cheap labor which made Belgium a formidable competitor in European and foreign markets is as much ancient history as the 34 shillings a week of the Yorkshire machinists. Belgian labor has gone up since the war and may keep on going up, although some people here think that the apex has been reached. It is reasonably certain to work up to an equality with that of other European countries.

I noticed yesterday a letter in the London *Times* from an English manufacturer saying that "railway fastenings," which were £9 7s. a ton in 1914 in England and about the same on the Continent, were now £44 to £46 in England and £30 in Belgium, a difference which will prevent English manufacturers from selling into South America and other foreign markets. If our English friend will be patient for a time he will see a change in Belgian prices.

The king is wonderfully popular among all classes, and his throne, which stands among the Continental nations like the traditional lone pine, is in no danger; but that doesn't mean the Belgian workers are not going to get enough pay to live at least as well as in 1914. Some are getting such wages now, but there are other low-wage scales still in effect that will have to be brought up to the average level.

In spite of the 119 recorded (and no one knows how many unrecorded) strikes in Belgium between Jan. 1 and May 1, 1919, the number of unemployed workers has steadily decreased. The great strike of railway and postal employees for an advance in wages, which meant an increase of 350 million francs during the first three months, has just been postponed, because the workers came to see the untold injury such a strike would cause the nation during the period of reconstruction, thus indicating a willingness to listen to reason which is not always a part of the labor program.

Employers seem to recognize the changed conditions, and have not only increased wages but have arranged a gradual reduction of the hours of work, which were 10 before the war, are now 9, will soon be reduced to 8½, and in 1920 to 8. Some plants have an 8-hour day now. Machinists' wages have increased from 225 per cent. to 295 per cent. (the present rate being from 19 to 34 U. S. cents an hour) according to the locality and class of work.

Those who are particularly interested in the development of Belgian industries of all kinds should send to the Department of Commerce for the reports of Trade Commissioner H. T. Collings, who has been in Belgium for about a year, and during that time has compiled a mass of valuable information regarding the industries he has been investigating. In this letter I have necessarily left untouched any subjects covered by his reports.

There have been quite a number of changes among Belgian dealers during the war. The A. H. Schutte warehouse was leased by the Allied Machinery Co., and recently bought by Alfred Herbert, Ltd., who will occupy it as soon as the Allied lease expires. Isbecque & Co. has given up its Antwerp place, and its main office and wareroom are now located at 36 Rue Otlet, Brussels, where it has very convenient accommodations. Henri Benedictus has also closed his Antwerp place and has taken the Steinhaus quarters at 133 Rue du Progress, which are well adapted to his business. R. S. Stokvis et Fils are at the same place, but find it too small for their requirements. Fenwick Freres still have their Belgian headquarters at Liege, but have decided to move to Brussels in about three months, and the tendency among Belgian machine-tool dealers is to concentrate in that city.

Packing and Shipping

Some of our manufacturers are still careless about packing and shipping, although more than plenty has been published about these requirements. Many breakages occur because light projecting parts, like gear guards and small pulleys, are not detached. In one lot of 10 light grinding machines I saw, four of the machines had broken parts—all of which must be remade and fitted by the buyer. In one heavy machine the lead counterbalance for the spindle had not been locked, and the constant motion caused it to work into an adjoining gear. Machines that have been taken apart by the makers are frequently sent without the parts being numbered or any diagram or instructions for reassembling. Most manufacturers do not properly slush parts of their machines liable to rust. "Sweating holes," about 1½ in. in diameter, one at each side of the case to admit of air, are advised. All heavy cases should be well strapped, weights should conform to those in catalog or invoice to avoid trouble with Custom House; and (this I wrote 15 years ago) all cases should have the contents indicated and should carry the numbers and marks furnished by the buyer.

For many years previous to 1914, Belgium was a

hive of industry, and I believe she will recover more quickly from the effects of the war and enjoy a greater proportionate degree of prosperity than any other European nation. The love of the Belgians for their king, and their trust in him, will insure the blessing of a stable government which will be worth hundreds of millions to Belgium during the coming period, while her neighbors are going on with costly experiments in economics and government. I think Belgium's prosperity and expansion will work out largely in the manufacture of metal products. Higher wages having come to stay, Belgium will be a very large buyer of machine tools, especially labor-saving machines, and the great part of these machines will be bought, not by the great works like the Fabrique Nationale, Cockwill or Minerva, but by hundreds of small shops that we never have heard of, which will start up, grow and expand with Belgium's growth and expansion. Compared with the volume of these purchases during the next 10 or 20 years the six-million-dollar sales of our War Department will cut a very small figure. Whether or not most of these tools will be bought in the United States depends upon a number of factors—the principal one now is exchange. If anyone is banking on Belgium buying tools from us out of gratitude, or for any other reasons than strictly business ones, he may as well forget them. The enmities engendered by the war may last for a long time, but the friendship, as applied to business, has already disappeared. France and Belgium will buy in future where they can get the most for their money, excepting possibly in Germany—for a time.

Summary of European Industrial Conditions

Great Britain

Demand was good in July for machine tools, and many manufacturers full of orders, but output restricted by labor troubles, and no immediate prospect of improvement. Some tendency toward specialization. Comparatively few British machine-tool builders have profited by their experience during the war; many are continuing pre-war methods. Motor-car manufacture is very active. Various associations have been formed to facilitate manufacture and selling and develop foreign trade. A number of firms have started making small tools and accessories. About 200 shops are now engaged in machine-tool building, having about 31,000 employees. Small tool and accessory lines comprise about 100 shops with about 7500 employees.

France

The enormous expansion in the use of machine tools during the war caused a surprisingly small increase in the number of French machine-tool builders. Two or three of the older firms have enlarged their plants and improved their equipment, but the remainder do not appear to have made any changes of importance since 1914. Labor is settling down, and French thrift again controls the situation. Business in machine tools appears to be good, especially in the northern and northeastern parts of France, but even in those sections French manufacturers are buying German machines rather than American on account of the difference in price, which difference is accounted for principally by the present exchange rates. The large number of American tools used in France during the war, most of which were creditable examples of American products, have been a great help in educating French manufacturers in the use of machines of the best quality. It is probable that after the present demand for machine tools in France is satisfied, there will follow a quiet period, which in turn will be followed by a gradual and healthy increase in demand, keeping pace with the expansion of the French metal manufacturing industries.

Italy

During the war 42 factories produced machine tools in Italy, and all but about a dozen have returned to their pre-war product. Lack of coal and other natural resources is a heavy handicap to Italy, and the industrial outlook there is very uncertain. Few manufacturers are educated to the desirability of buying expensive American tools, which must be sold in competition with German tools at much lower prices. A good many American tools used in munition work are coming on the market.

Switzerland

Before the war there were only two machine-tool building concerns of any importance in Switzerland. To these were added about a dozen, most of them continuing in business and producing more machine tools than the small Swiss machine-tool market can absorb; but there will continue to be a demand for American tools of high reputation, because Swiss mechanics appreciate machines of quality. At the present time, with German tools selling for much less than American, it is evident that only the high reputation and sterling qualities of American machines will enable foreign dealers to sell them in Switzerland.

Holland

There has been a distinct increase in the manufacturing industries in Holland during the war. A great many Dutch machine-tool dealers, being unable to get American machines during the war, turned to German makers, and the Dutch market is now flooded with German machines. It is estimated that these stocks will not be worked off until about 1921, and then only if shipbuilding and other industries requiring them continue to be prosperous.

Germany

There are now 320 machine-tool builders in Germany, nearly all belonging to a German tool builders' association which had only 72 members before the war. The members of the association employ about 60,000 men, in addition to a fairly large number of women. They manufacture practically all types of machine tools, many of which are close or direct copies of American makes, and are offering them all over Europe at prices which make American competition difficult. The low German prices are caused largely by the depreciation of the mark.

Austria

In what remains of Austria the machine-tool industry and all others are on such an uncertain footing as not to warrant consideration, and in Hungary the new government is too young for anybody to venture an opinion about the future. In Prague, business is said to be encouraging, and the Czecho-Slavic government apparently is growing in strength. Machinery dealers in Berlin say they are doing a good business with

Finland, and expect to with Russia when conditions are settled.

Scandinavia

Reports from the Scandinavian countries indicate that the German competition there is so keen that it will not be possible for some time to come to sell American machine tools to any extent, German machines being offered for about half the price of American tools. Scandinavian industries which were busily engaged during the war and made large extensions, are now able to market only 50 to 60 per cent. of their capacity, and are therefore not in the market for machine tools to any large extent.

Cost of Materials

The following figures give an idea of the increase in the cost of raw materials: In Great Britain, mild steel bars, from £6 5s. 0d. a ton in July, 1914, to £19 in June, 1919. Pig iron, from £2 14s. 0d. a ton in July, 1914, to £8 10s. 0d. in June, 1919.

In Germany pig iron increased from 74.50 marks per ton in 1914, to 356.50 marks in 1919. These prices have now dropped from 52 to 90 marks per ton, but the Pig Iron Union states that at the reduced price the blast furnaces are working at a heavy loss. Steel sections sold for 110 marks per ton in May, 1914, and for 520 marks per ton in May, 1919. High-speed steel sells for 27.50 marks per kilogram.

Great Britain—Machinists' wages in 1914 averaged from £1 14s. to £1 19s. per week, and in 1919, £3 12s. to £3 15s. In addition to this increase in wages, the hours have been reduced from 53 or 54 hours to 47 hours, and a further reduction to 44 hours per week is being considered. For women in the machine industries 18 years of age and over, not engaged in men's work, the present minimum is 38 shillings per week. Higher rates are paid to women engaged on men's work.

Germany—The wages of machinists and machine operators in 1914 varied from 0.48 to 0.75 mark per hour. The present wages for corresponding classes of workers vary from 2.55 to 4 marks per hour. Blacksmiths received from 0.95 to 1.15 marks per hour in 1914, and are now receiving from 3.50 to 4 marks per hour. In this connection it should be stated that the production per hour per man during the first six months of 1919 was only about 50 per cent. of the production prior to the war. All over Germany the 8-hour day prevails, and in some shops 44½ hours is the standard working week.

France—Machine operators in 1914 received from 0.95 to 1.25 frs. per hour. In 1919 the rate is 3.75 frs. Assemblers received in 1914 from 0.95 to 1.90 frs. per hour, and in 1919, 3.80 frs. per hour. Unskilled labor now receives 2 frs. per hour, which is double the wage in 1914, while toolsmiths receive from 4 to 5 frs. per hour, which is about three times the 1914 rate. Eight hours is the legal day.

Belgium—In the machine-shop industries in Belgium, a 54-hour week was the rule, except when the workers are employed by the government, in which case a 48-hour week is standard. A gradual reduction is arranged to an 8-hour day in 1920. Belgian wages as compared with June, 1914, show an increase of from 150 to 200 per cent. In the early summer of 1919, machinists received from 85 to 105 francs per week of 54 hours.

Sweden—Machinists receive about 12 crowns per day, while toolmakers get from 16 to 20 crowns per day.

For convenient comparison, the present wages in the United States are here given. In Detroit, the prevailing rate for machinists is 75 cents per hour, and for laborers and helpers, 50 cents per hour, with the latter asking for an increase to 60 cents per hour. In Philadelphia, rates for machinists vary from 65 to 80 cents per hour. In Pittsburgh, helpers and laborers get from 30 to 40 cents per hour; machine operators with limited skill, from 40 to 50 cents; medium-class machinists, from 50 to 60 cents; first-class machinists and medium-grade toolmakers, from 60 to 70 cents; and high-class toolmakers and machinists on exceptionally important work, 70 to 80 cents an hour. In Connecticut, wages vary from 45 to 65 cents per hour for machinists, with unskilled labor paid at from 32 to 40 cents an hour. Toolmakers receive from 55 to 75 cents an hour. In New York City, toolmakers receive from 75 to 85 cents an hour, and in exceptional instances, for the very highest class of diesinkers, from $1 to $1.10 an hour.

Various Notes in Response to Inquiries

During the war there has been a greater permanent development in machine-tool building in Germany than in any other European country, and she will be our strongest competitor in future.

It will be some years before France will be able to fully utilize her new coal and iron resources, and it is difficult to forecast the effect on British industry during that period. It seems to me that these changes will work out more to the advantage of Belgium than any other European country, for several years.

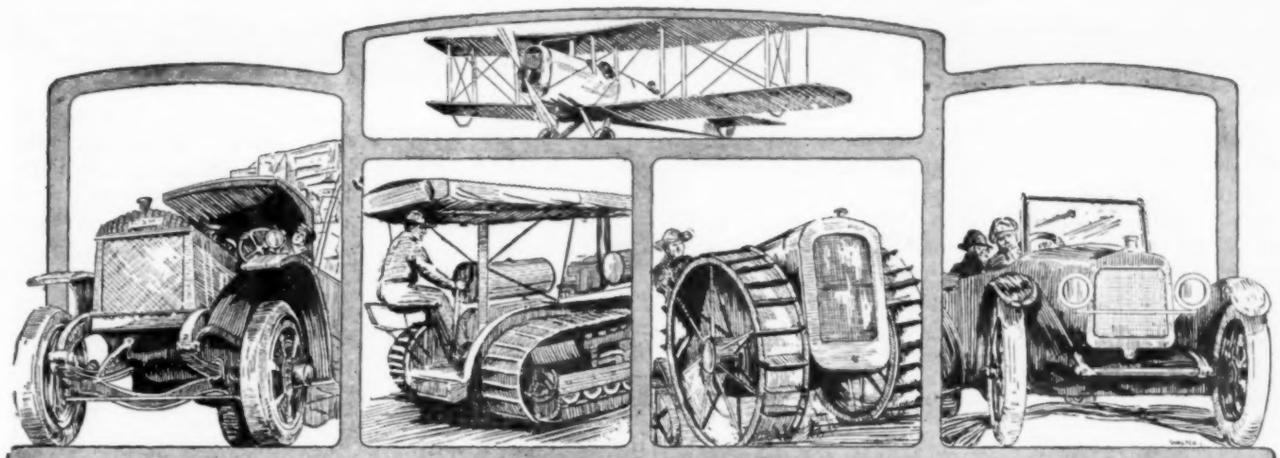
Our manufacturers must depart from their custom of requiring payment against B of L New York, if they are to do business with Europe. This custom is almost as great a handicap to foreign trade as the present exchange rates.

Swedish manufacturers have formed an association under the name of Svenska Verktygsmaskinfabriks Export Aktiebolaget, which is said to be offering machine tools on payment of 20 per cent. cash and the remainder to be left at 5 per cent. interest until the exchange rate becomes normal.

The decrease in German efficiency referred to in the article on that country is not paralleled in any other country, although the demoralizing effects of war conditions are visible everywhere. There is considerable "slacking" in Great Britain and discouragement in Italy, but from different causes. The spirit of unrest in Great Britain is nearing the peak, but there and here the labor situation is a long way from normal—by which I mean conditions under which employers can rely on labor and figure their future labor costs with certainty. In Belgium and France labor unrest is subsiding. In Italy it is impossible to foretell what will happen.

German manufacturers are planning and working to regain their markets. Germany formerly had an enormous trade with Russia, and as soon as conditions warrant will surely resume commercial relations with that country.

The countries where our machine-tool manufacturers will find the strongest competition are Great Britain and Germany, although Scandinavia and Switzerland will sell in their own and other European markets.



AUTOMOTIVE CONSTRUCTION

"Caterpillars" and Their Construction—IV

By K. H. CONDIT
Managing Editor, *American Machinist*

The controversy between the high-speed, light-weight automotive engine experts and those who advocate the slower, heavier type still rages, one side leading in one field of development and the other somewhere else. The latter class finds one of its shining examples in the caterpillar-tractor motor.

(Part III appeared in our previous issue.)

IF THE motor is the heart of an automobile it is equally vital to the traction engine and in ordinary tractor use it is subjected to strains that would induce angina pectoris, heartburn, or valvular trouble of a serious nature in a weak organ. Consequently, it must be sturdy to a marked degree and able to give steady service under all sorts of conditions. The British army went a long way in supplying all sorts of weather to test the caterpillars by using them in France, Gallipoli, Egypt and Mesopotamia in all seasons. At this writing there is no record of their having been used at Archangel or on the Murmansk Coast but they would undoubtedly have given the same reliability under such arctic conditions because they have already done similar work in Rocky Mountain snowdrifts.

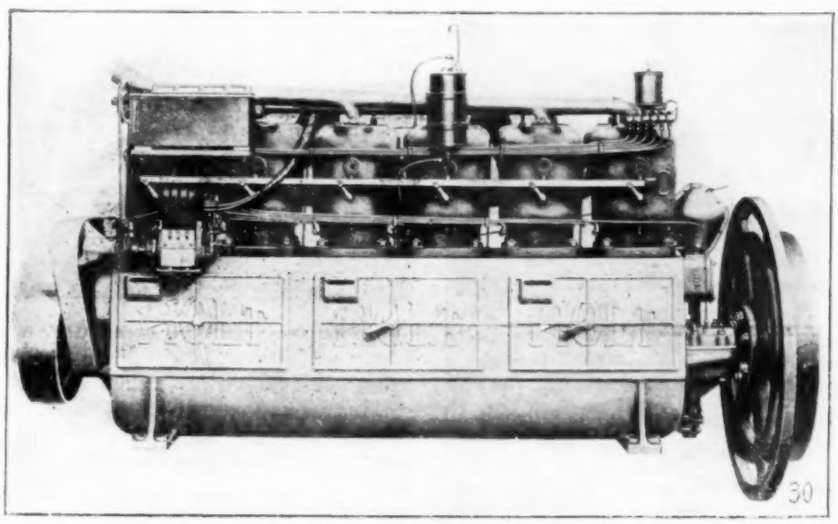


FIG. 30. SIDE VIEW OF 120-HP. ENGINE

As most of this series has been devoted to the 120-hp. caterpillar this description will be confined to the six-cylinder motor used in that machine which differs materially from the ones used in the smaller models. The demands of the various governments for which the Holt Manufacturing Co. was building tractors were so insistent, that standardization of a line of motors of varying power, as the design of the Liberty motor was standardized, was out of the question, and the L-head cylinders of the "120" bear slight resemblance to the detachable I-head ones used in the "75." Each gives results, however, which is the principal requirement.

The 120-hp., six-cylinder engine, shown in Figs. 30 and 31, develops its rated power at 550 r.p.m. With such a slow maximum of speed no attempt has been made to counterbalance the crankshaft and the unconventional firing order of 1-3-5-6-4-2 is used without undue vibration and rock. The cylinders have a base of 7½ in. and a stroke of 8 in., placing this motor among the largest mobile internal-combustion engines built. With cylinders of this size even a low-compression motor requires some form of compression release to enable it to be started by hand; on this one relief cocks, low on the side of the cylinders and connected by a long bar, are fitted as shown in Fig. 30.

An extra-heavy Stewart vacuum tank is fitted to take care of the fuel feed to the carburetor when the tractor travels up or down a 100-per cent. grade—not an unusual feat, by the way. Lubrication is by combined gravity, splash and force feed; a double-gear pump drawing the oil from the crank case and supplying the splash troughs, while a gravity oiler at one end of the

AUTOMOTIVE CONSTRUCTION

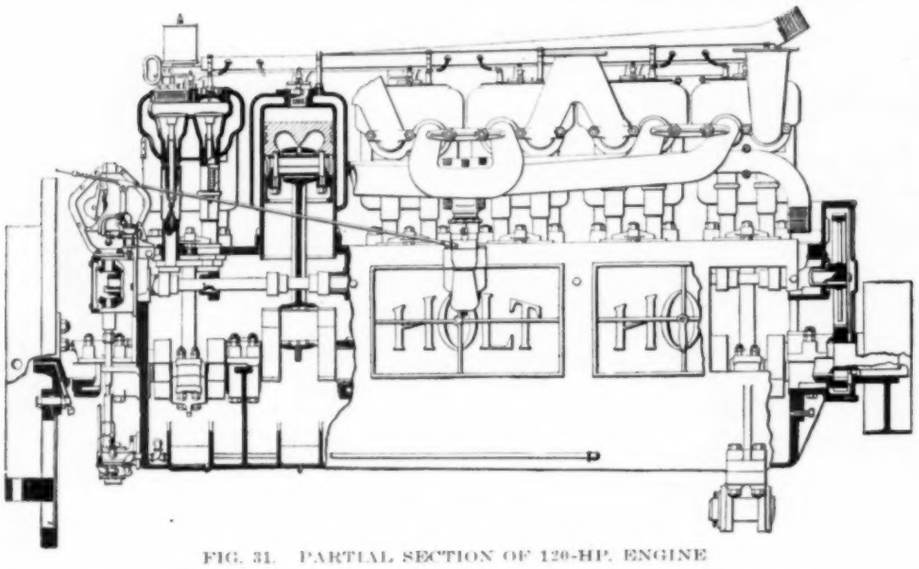


FIG. 31. PARTIAL SECTION OF 120-HP. ENGINE

motor and a belt-driven force-feed lubricator at the other feed cylinder walls and main bearings.

Air strainers remove the dust from the carburetor intake air, a very necessary task on a traction engine, and ignition is by high-tension magneto with impulse starter. An unusual feature is the separation of the water circulating pump from the engine, it being mounted independently on the main frame and driven by the same flat belt which drives the fan.

The crank case is of the barrel type and is provided with large side plates which afford access to the bearings and permit the removal of connecting-rods and pistons without disturbing the cylinders. The crank cases are iron castings and the machine arrangement to take care of them is quite compact.

In Fig. 32 it will be seen that the sides of the two cases facing the man with the steel scale are inclined inward at the top. For the first machine operation the case is placed with the inclined face downward and resting on wedges, in which position the opposite side and the top are planed simultaneously. The cases are then shifted to the milling machine shown in Fig. 32 by means of an air hoist running on an overhead rail and the tapered side is milled, wedges again being used to bring it horizontal. The case is then turned over and the bottom is milled, the operation shown in the illustration. Efficient use of the machine is indicated here by the set-up of two cases on the table and the row of radiator headers lined up along the side to make use of the side heads at the same time.

FIG. 32. MILLING CRANK CASES AND RADIATOR HEADERS

The next shift takes the cases to horizontal boring mills where the ends are milled, the end holes bored and the camshaft and crankshaft bearings bored and reamed. Top and bottom holes are drilled in ordinary drilling machines, a simple templet jig being used for the top.

The crankshaft is a 0.35 to 0.45-carbon-steel drop-forging nearly 8 ft. long and is heat-treated to an elastic limit of 65,000 to 70,000 lb. per sq.in. Upon entering the shop it first passes through the rough-grinding department where the burrs and rough spots are removed. It then goes to a 24-in. lathe with graduated bed where it is laid out, the steadyrest grooves turned and the extra lengths cut off. The flange is next turned and faced and the main journals turned to limits of 0.004 in., Fig. 33. The shaft is then transferred to a lathe with offset centers and the crankpins are turned to the same limits. The six holes for the flywheel bolts are next drilled in a horizontal drilling machine and finally the journals are ground to limits of 0.001 in. and the crankpins to 0.002 in.

FIG. 33. TURNING CRANKSHAFT MAIN JOURNALS

The heavy, singly cast, iron cylinders start their course in the machine shop at a drilling machine where the priming-cup hole in the center of the head is drilled and counterbored to serve as a locating point for succeeding operations. The cylinder is then placed in the heavy pot-chuck shown in Fig. 34 and rough- and finish-bored to 0.015 in. to 0.018 in. from final size. Another tool chamfers the end of the bore. The following transformation, made on an adjacent machine, consists of facing the flange and turning the skirt and the work is then sent to the drilling machines where the first operation is to drill the four stud holes to act

AUTOMOTIVE CONSTRUCTION

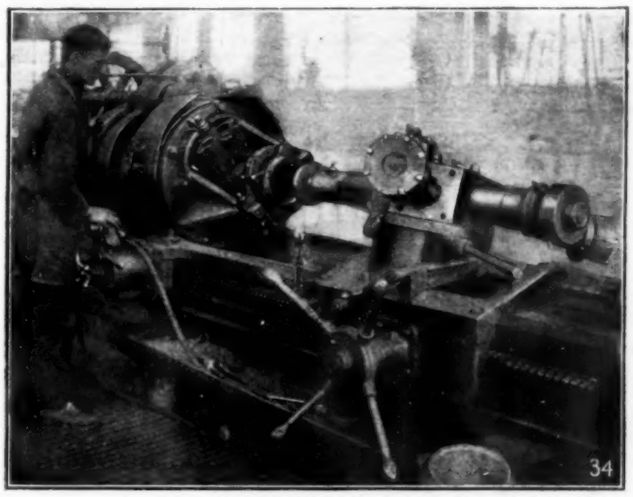


FIG. 34. BORING THE CYLINDER

as locating points for the other drilling operations. The valve seats and valve-stem guides are bored and reamed and the pipe-connection holes drilled and tapped and the cylinder then proceeds to the milling department where the upper and lower water manifold flanges and the inlet and exhaust port flanges are faced. The bore is then finished in an internal grinding machine, water being circulated through the cylinder water jacket during the process.

Fig. 35 shows the piston and connecting-rod assembly. The various machining operations on the rod were taken up in detail in the previous series of articles on the "75" as built in the Stockton, Calif., plant of the Holt Manufacturing Co. The four-bolt type of bearing-cap connection and the oil scupper on the cap are worthy of note. The piston itself is of cast iron with three compression-ring slots and three oil grooves. The piston pin is held in by two setscrews which run clear through the pin and into recesses in the bosses, the piston-pin bushing being held in the connecting-rod.

The raw piston casting goes first to an 18-in. lathe where the lower lip is rough-bored and the face turned. The outer surface is then rough-turned and the solid end faced. After this the piston goes to the heat-treating department where it is baked from 60 to 80 min. at a temperature of 1400 to 1500 deg. F. to relieve cooling strains and prevent distortions. The lower lip and face are next finish-turned and the outside finish-turned, slotted and faced in an automatic turret lathe. Oil weepers and pin retainer holes are next drilled. The rough-grinding operation is then completed and the piston moves to a turret lathe where the piston-pin holes are bored and reamed and the bosses faced. Finish-grinding completes the part.

This takes care of only a few of the motor parts but most of the machine work is quite conventional and is noticeable principally because of the size of the work. Here again pressure of war work has kept old methods in force to prevent possible hold-ups in production.

The radiator, however, possesses several unusual and valuable features. Front and rear views of the radiator are shown in Fig. 36 which illustrates the double coil-spring supporting arrangement to protect the more or less fragile tubes from the shocks of traveling over rough ground and, in the rear view, the sight glass through which circulation is observed and the sheet metal shroud to insure air being drawn through all parts of the radiator.

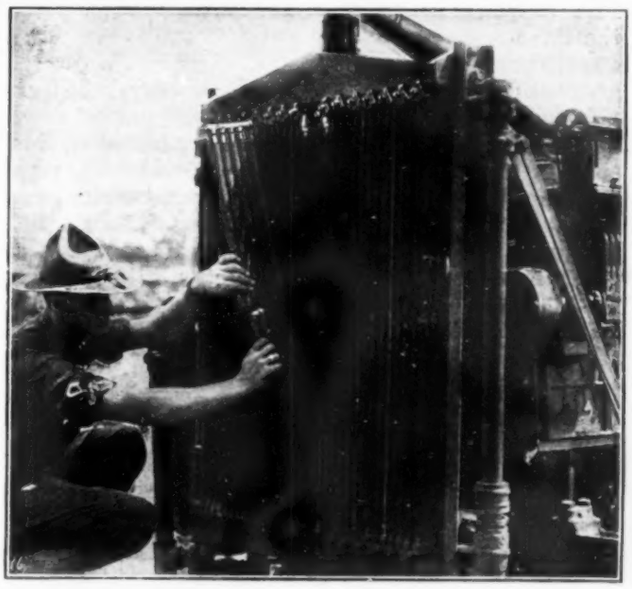


FIG. 37. REMOVING DAMAGED RADIATOR SECTION

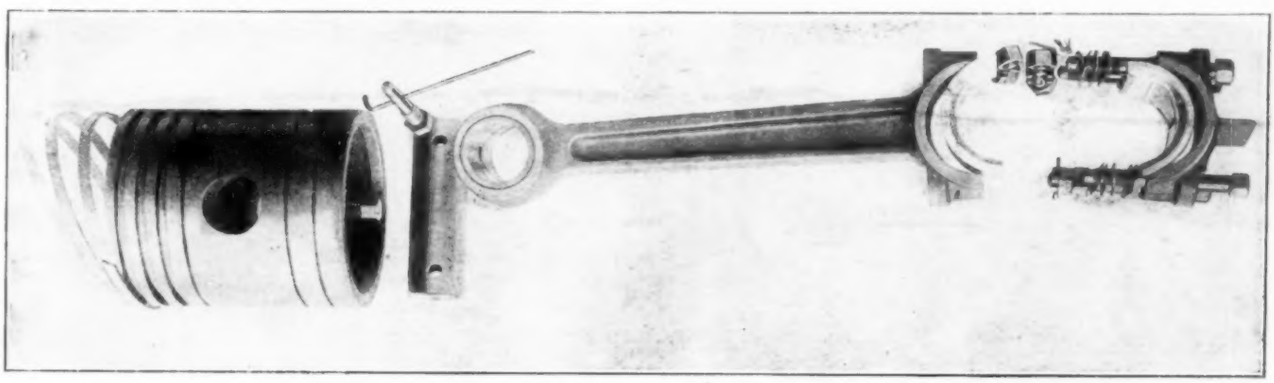


FIG. 35. PISTON AND CONNECTING-ROD PARTS

AUTOMOTIVE CONSTRUCTION

The radiator consists of upper and lower cast-iron headers and two channel-iron side members which are bolted together and in which are mounted the 32 radiator sections. Each section has five copper tubes with spiral fins which are fitted into brass section headers. The section headers are held in place by the three-pronged dogs shown and are readily removable for repair as illustrated in Fig. 37. This feature is particularly valuable for field service or military work where a repair shop is not readily available. If extra sections are not available and the damaged one is beyond fixing the radiator may be kept working at almost its ordinary efficiency by replacing the damaged section with blind gaskets inserted between the header holes and the section header ends, thus cutting off the circulation from the damaged unit. Leaving out the broken piece altogether and plugging the header holes would result in most of the air being drawn through the vacant spot thereby allowing the rest of the radiator to heat up too much.

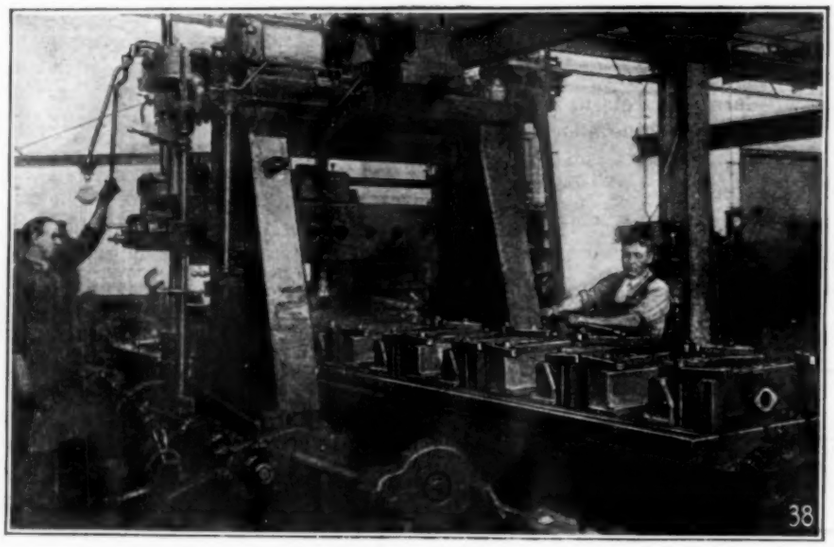
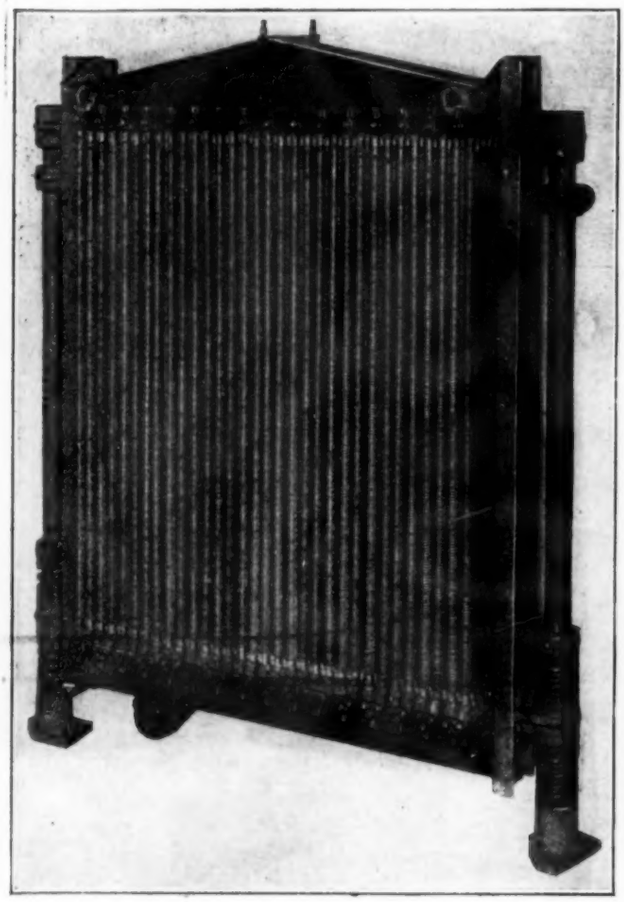


FIG. 38. STRING-MILLING RADIATOR HEADER ENDS

Milling operations on the cast-iron headers are interesting principally from the number of pieces set in the machine at one time. The facing of the top flange is shown in Fig. 32, where the pieces are set up alongside the crank cases to make use of the side heads of the machine. In Fig. 38 the headers are shown set for the end cuts, 14 pieces being put in



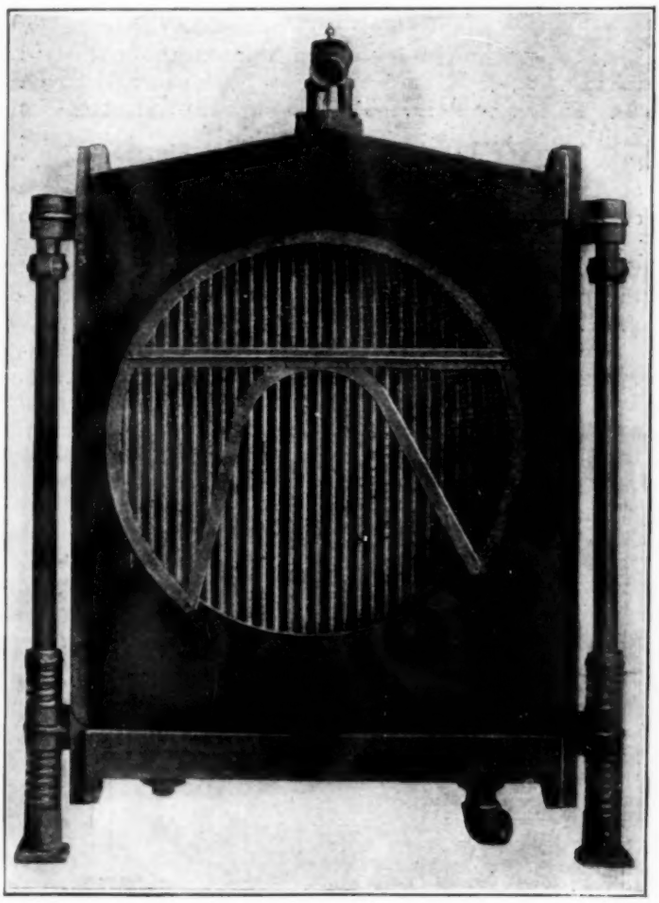


FIG. 36. FRONT AND REAR VIEWS OF RADIATOR

AUTOMOTIVE CONSTRUCTION

the machine at once. The other milling operation on these parts consists of finishing the surface for the tubes and is done on a vertical milling machine. The holes for the section headers and retaining studs are drilled in a 16-spindle drilling machine and the tapping is done in a Garvin tapping machine.

Machining of the brass section headers includes reaming and countersinking the five holes for the copper radiator tubes and hollow-milling the end which enters the radiator header. A $\frac{3}{16}$-in. hole is also drilled in the baffle plate to permit air to enter when the radiator is being drained. This is made necessary by the fact that the circulation system is a closed one which would become air bound if this hole were not drilled. The headers are next dipped in muriatic acid and then in hot solder to tin them.

In the meantime the finned copper tubes have been stripped at the ends and for a short distance in the center for a supporting clamp and the ends tinned. Five tubes are then assembled into each pair of section headers and soldered in place and each section is tested under 20 lb. water pressure for leaks.

The sections are then assembled in the radiator frame and the radiator is tested under the same water pressure as the headers. The inspectors on this test are provided with hammers and electric spot lights and they don't hesitate to use both to determine the presence of leaks.

The final installment will take up the assembly and testing of caterpillars at the Peoria plant.

Four Simple Fixtures for Motor Work

BY FRANK C. HUDSON

While large production enables the designing and employment of fixtures of various kinds which are too expensive for the ordinary shop, it often requires fully as great designing ability to prepare fixtures simple enough to be used economically with small production. The first two illustrations show the methods of the Autocar Co., Ardmore, Penn., in grinding the head of its valve lifter.

Fig. 1 shows a lifter *A* clamped into position ready to be placed on the table of a small horizontal-spindle grinding machine. The body of the lifter rests in the V-block *B*, while the head is positioned by the plunger *C* which is pressed back as the head makes contact with it. The T-head bolt *D* is then swung into the position shown and is tightened by the handle *E* which is virtually a nut for drawing the work against the holder. Two of the valve lifters are usually ground at the same time, but in the picture one has been omitted so as to show the construction of the fixture more clearly.

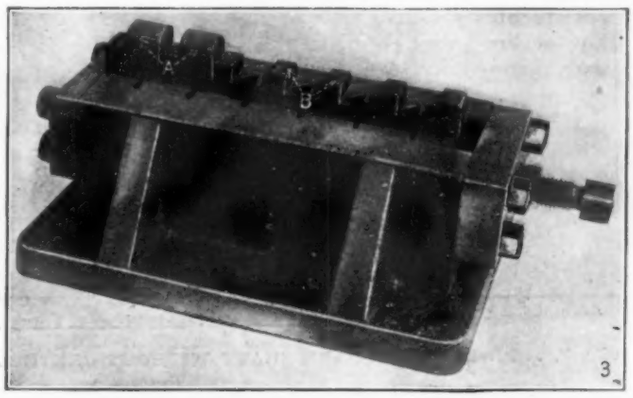


FIG. 3. MULTIPLE MILLING FIXTURE FOR VALVE LIFTER

For grinding the radius on the head, another simple fixture, Fig. 2, has been provided. The body of the valve lifter *A* rests in a V-block *B*, the side of the head previously ground resting against the stop *C*. The radius is then formed by turning the movable part of the fixture on its axis, the stop *D* being provided so as to make it easy to handle the fixture without undue attention.

A multiple milling fixture for these same valve lifters *A* is shown in Fig. 3. The action is easily understood as the blocks *B*, used for clamping, float in the body of the fixture and all are held with a uniform grip by tightening one screw. The floating of these blocks make it possible to machine any desired number from one up to its full capacity.

The fixture shown in Fig. 4 is the outcome of more or less satisfactory results in grinding the square shaft

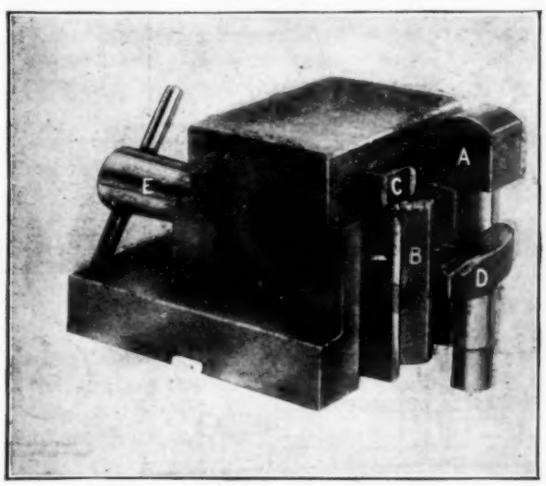


FIG. 1. GRINDING FLAT FACE ON VALVE PLUNGER

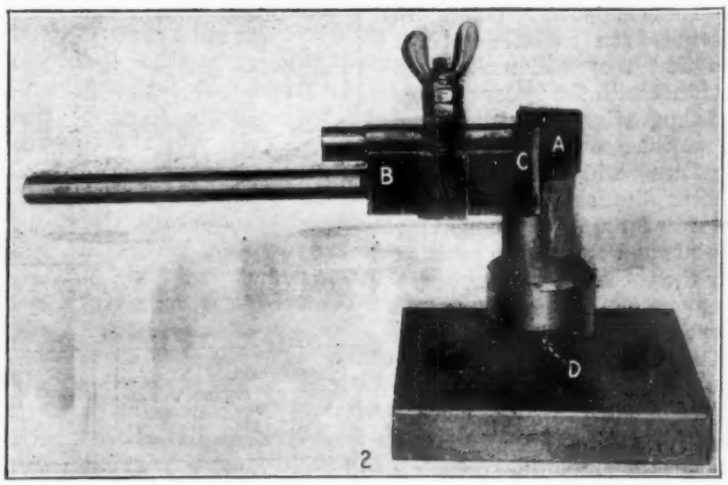


FIG. 2. HOW THE RADIUS IS GROUND

AUTOMOTIVE CONSTRUCTION

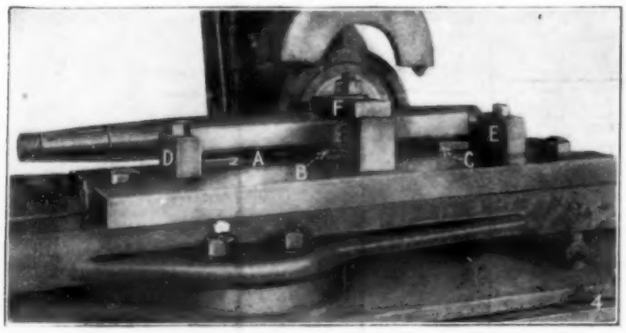


FIG. 4. GRINDING A SQUARE SHAFT WITHOUT CENTERS

shown between centers. After the shaft has been milled, it is laid on the hard-steel blocks *A*, *B*, and *C*, with the cylindrical ends in contact with the stops *D* and *E*. The strap *F* holds it in place, but requires very little pressure. After the first side is ground, the shaft is turned so that the ground side rests on the hardened-steel blocks, and, as these are at right angles with the spindle of the grinding machine, the second side is finished at 90 deg. from the first.

By locating the cylindrical surfaces against the stops *D* and *E*, it is an easy matter to grind the four sides concentric with the shaft itself. An adjusting screw enables the fixture to be kept square with the grinding-machine spindle, so as to secure parallel instead of taper sides.

Milling Fixture for Crank-Case Gear Cover

BY I. B. RICH

Fig. 1 shows the fixture used by the Pierce-Arrow Motor Car Co. for milling the joint surface on the crank-case gear cover. In order to avoid any springing of the casting under the pressure of the milling cutter, it is supported at 13 points properly distributed around the edge.

These supporting points are mounted on suitable springs so that they will make good contact with the under surface of the casting and at the same time take care of any irregularities which may exist. After the casting is firmly steadied on these supporting points and clamped in position by the three studs shown, each supporting plunger is then fastened in its position by the setscrew provided for this purpose.

This has proved very successful and no difficulty is experienced from the springing of the valve-gear-cover casting, even though it is of light section and a fairly heavy cut is taken.

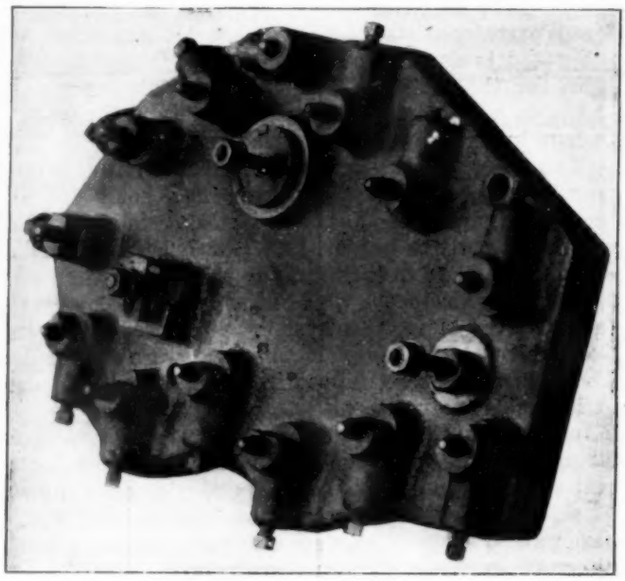


FIG. 1. MILLING FIXTURE USED FOR MILLING CRANK-CASE GEAR COVER

The construction details of this fixture are shown in Fig. 2. This shows the work in position and the way in which the spring-actuated supports make contact on the under side of the bolt flange. It also shows how they are held by setscrews after being properly positioned.

The type of washers used is also shown, some being in the form of C- or open-side washers having three raised points for contact with the work, though in one position a solid washer is used.

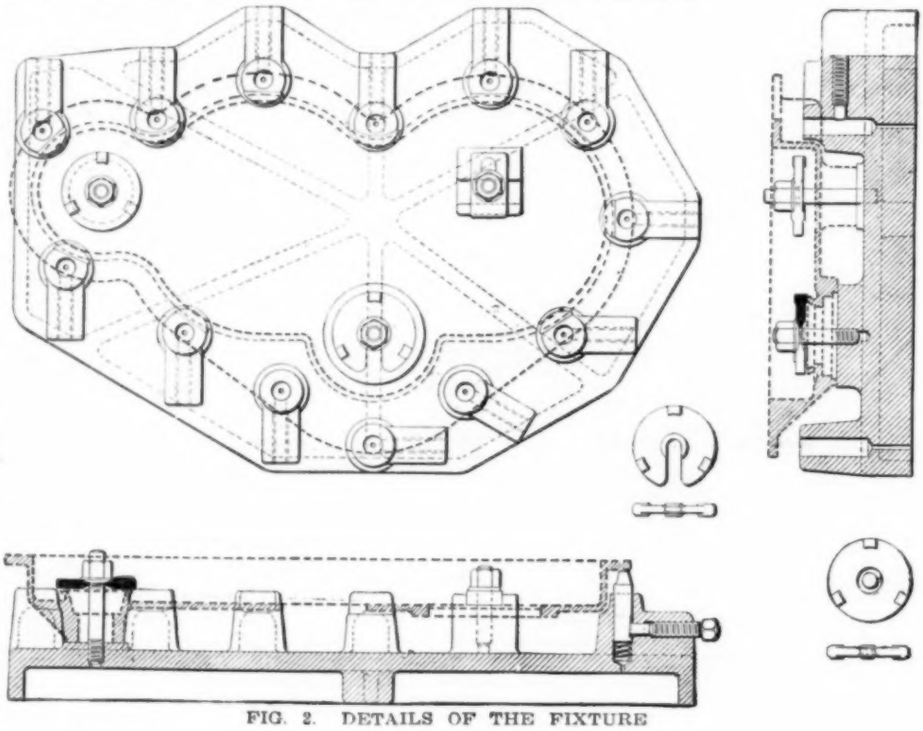


FIG. 2. DETAILS OF THE FIXTURE

How to Use Stellite

By G. L. KRONFELD

Stellite is an alloy composed of cobalt, chromium and other semi-rare metals and as its strength is much less than that of steel it will consequently not stand the rough usage frequently given the latter metal. This article deals with stellite as used in the art of cutting metals, the object being to outline a few points that should be taken into consideration, as well as to describe some of the tools made from this alloy.

FOR ordinary shop practice No. 2 grade stellite is recommended for steel and No. 3 for cast iron, malleable iron and other cast metals. A No. 4 grade stellite has been manufactured, but this grade has not been sufficiently commercialized to enable any definite information to be given in regard to it. The writer also recommends No. 3 grade stellite for hard steel, nickel steel, chrome-vanadium steel and hard metals in general. It is advantageous in all cases to determine the proper grade of stellite to use on hard and tough steels by actual test. On soft grades of cast iron No. 2 grade stellite will often show up to decided advantage, especially in the inserted teeth of milling cutters.

Stellite works best at high speeds and consequently it is not economical to use it on machines that will not stand the "gaff," or are in such condition that the work cannot be machined at efficient speeds and feeds. One of the sources of trouble when using stellite is the belting. Slack, oily, badly patched and worn belts are not coincident with good shop practice, irrespective of the kind of cutting tool used. There is absolutely no use speeding up a machine or trying to obtain heavy cuts unless there is the proper "push" behind the tool and, in the writer's judgment, it is false economy to use stellite unless the equipment in every sense of the word is capable of doing what is asked of it.

When first using stellite it is recommended: For machining cast iron and malleable iron, at first to maintain the usual depth of cut and rate of feed and increase the speed between 25 per cent. and 50 per cent. over that when high-speed steel is used; for machining steel with stellite, a little discretion should be used and, to start out with, the feed should be slightly decreased and the speed increased 25 per cent. to 100 per cent. according to its hardness and toughness. Anybody conversant with ordinary shop practices can readily judge, once the tool and work are running satisfactorily, how to adjust his feeds and speeds to obtain the most economical commercial results.

As a general rule it is not economical to increase the speed to such an extent that the amount of work done between grinds falls below that of high-speed steel. Most efficient results are attained when the tool life of stellite is equal to, or better than, that of high-speed steel. Where the conditions are favorable, a tool life of stellite can readily be attained which is considerably longer than that of high-speed steel, in spite of the increased cutting speed. Under certain conditions, such as machining hard castings, hard steel, etc., where it is not possible to increase the speed or feed it has still been found advantageous to use stellite on account of its considerably longer tool life. Stellite cuts best when the tool has a dull-red, almost invisible, glow. This fact has been disclosed very often in actual practice when an increase in tool life has been obtained, not by decreasing but by increasing the cutting speed and, sometimes, the feed, instead of decreasing them. This fact should be kept in view, although in general the rule that increased tool life is obtained by decreasing the cutting speed should be followed.

There is nothing mysterious about the grinding of stellite tools—the same fundamental principles being involved for stellite as for high-speed steel.

On account of the hardness of stellite, tools made from it should never be given a "lip." The term lip should not be confounded with the terms back rake or side rake. On account of the peculiarity of stellite, however, departure from the fundamental rules has often lead to good results.

The writer recommends the rakes given in the accompanying table for stellite tools, which can be readily obtained on tools made from standard bar stock either used in toolholders or welded onto carbon-steel shanks.

TABLE OF RAKES RECOMMENDED FOR STELLITE TOOLS

Metal To Be Cut	Back Rake	Side Rake	End Rake
Cast iron, malleable iron and other cast metals	5 to 10°	0 to 8°	4 to 7°
Steel	5 to 14°	3 to 10°	4 to 7°
Brass	0 to 4°	0 to 4°	4 to 7°

It has been found that cast iron can be machined with a flat tool (that is, a tool without back or side rake) but a back rake at least is strongly recommended that will give a lip angle of 68 deg. to 81 deg., according to the grade of cast iron to be machined.

Due to the fact that stellite is a cast product the metal is harder on the outside than toward the core, and on this account the writer suggests that a stellite tool should not be ground on the top except when absolutely necessary. For this reason it is recommended that only sufficient side rake be given a tool to allow the chip to run off nicely. Standard commercial toolholders are made so that a back rake is given the bit; and where comparatively light cuts are taken, the machinists should be instructed not to grind the top of the stellite tool.

One of the chief troubles when using stellite is breakage. When deciding what type of toolholder to use, this fact should be given due consideration. There are several toolholders on the market suitable for stellite. It is the writer's experience that the toolholder giving the best results will hold the stellite firmly as near the cutting edge as possible and not in any way bend the bit. Irrespective of the type of toolholder used, care should be taken that the top and bottom are perfectly flat and free from chips. It has been the writer's experience that almost 90 per cent. of breakage trouble has been due to neglect of the above precautions. As a guide, it is suggested not to allow the bit to project unsupported farther than its depth.

The writer will describe a few homemade toolholders that have been used with success.

Fig. 1 shows a toolholder used successfully on various kinds of work. The sketch is self-explanatory. This

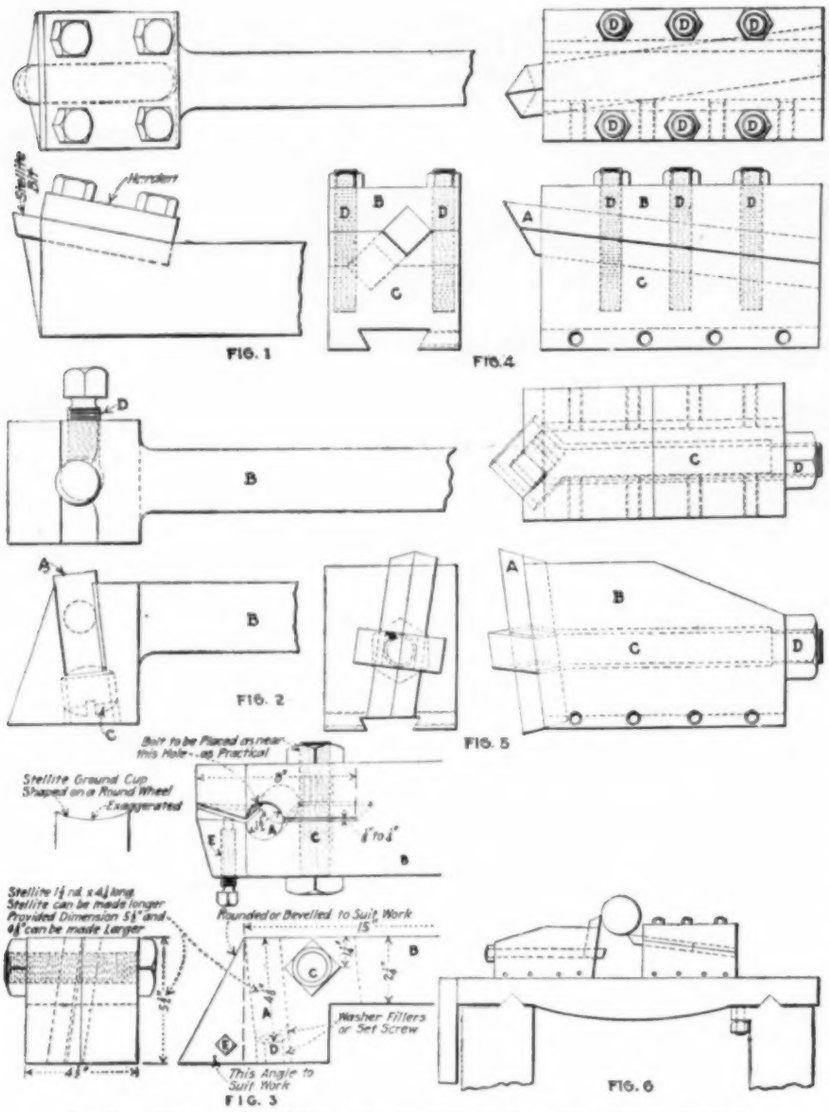

Stellite Bit
Holder
D
B
C
A
Built to be Placed as near this Hole as Practical
Stellite Ground Cup Shaped on a Round Wheel Exaggerated
Stellite 1¼ rd. x 4½ long. Stellite can be made longer Provided Dimension 5½" and 4½" can be made Larger
Rounded or Bevelled to Suit Work
Washer Fillers or Set Screw
This Angle to Suit Work

FIG. 1 FIG. 4 FIG. 2 FIG. 5 FIG. 3 FIG. 6

FIGS. 1 TO 6. EXAMPLES OF HOLDERS FOR STELLITE TOOLS

Fig. 1—A holder for square tools. Fig. 2—A holder for round tools used for turning shells. Fig. 3—A split holder for roughing tools. Figs. 4 and 5—Holders for holding square tools on end. Fig. 6—Method of using holders shown in Figs. 5 and 6.

holder is economical as the stellite can be used until but very little is left.

Fig. 2 shows a toolholder that was used successfully for finish rough-cutting and finish-turning shells. *A* is the stellite tool, *B* the toolholder body, *C* an adjusting screw, *D* a setscrew for holding the stellite tool *A* rigidly. It will be noticed that the stellite tool (¾-in. in diameter in this case) is set up on end and ground cup shaped. When the tool becomes worn in one spot the operator loosens setscrew *D* and gives the stellite tool *A* a slight turn and then tightens setscrew *D* again, thus gaining a new cutting edge on his tool. He can now proceed with his work without taking his holder out of the toolpost and without making any major adjustments on his lathe. This ¾-in. round tool will give four to five cutting edges on each end; making eight to ten per tool.

Fig. 3 shows a toolholder similar to that shown in Fig. 2. This was used very successfully for rough-turning shells. The 1¼ in. in diameter stellite tool *A* is clamped in the split toolholder *B* with bolt *C*. Washer fillers *D* are inserted as the tool wears down. Setscrew *E* is used to force open the split, should the stellite bit stick. The ends are ground cup shaped and each end will give at least four cutting edges. It must be borne in mind that tools, as shown in Figs. 2 and 3, offer too much resistance and consume too much power for ordinary shop practice although for their special purposes they gave excellent results.

Figs. 4 and 5 show holders for holding 1-in. square stock on end. The stellite tool *A* in Fig. 4 is clamped down by bolts *D* between the two body halves *B* and *C*. Fig. 5 shows the tool *A* held firmly against body *B* by pull rod *C* and nut *D*. As can be readily seen, both tools are used as diamond tools and the required rake ground on the end. The set-up on the lathe of both the toolholders (Figs. 4 and 5) is shown in Fig. 6, which is self-explanatory.

The above describes a few homemade toolholders in which stellite has been used successfully. Shop problems are so manifold, however, that it will always pay to investigate the designing of a suitable toolholder for production work, irrespective of the kind of cutting tool adopted for the particular job.

It has sometimes been found that stellite will give good results when the tool is set above the center, especially when chatter occurs. The writer has set the stellite tool 1 in. to 1½ in. above center when machining 6-in. shells and forgings of large diameter and has obtained longer tool life than when the tool was set on center or only slightly above. However, this point should not be taken as a general rule.

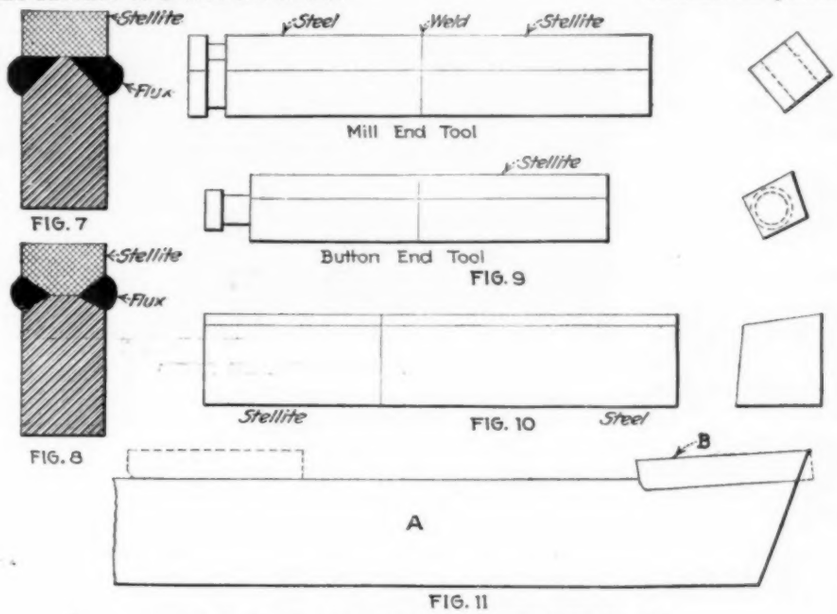
When stellite was first introduced many advocated welding it to steel shanks, either electrically or by the oxy-acetylene process. Such procedure is, in the opinion of the writer, too severe on both the stellite tip and the shank; although thousands of tools so welded have been used with astonishing success. A method of welding is as follows: The carbon-steel shanks and stellite tip are prepared as shown in cross-section in Figs. 7 or 8. The two units are then placed on a plate and welded together, soft iron or steel being used as a flux. Electric or oxy-acetylene welding of stellite tools is not recommended. Stellite can be successfully butt-welded onto steel shanks with an electric butt-welder, the process being similar to that of butt-welding steel. Butt-welded tools are advocated by many for Lo-Swing lathe tools and tools for Potter and Johnson automatics, as shown in Figs. 9 and 10.

Welding Stellite to Carbon Steel

For welding stellite to carbon steel, the writer strongly recommends the use of "Tip-It" welding compound. This compound affords an efficient and simple welding process, which is as follows: The shank *A* and the stellite tip *B*, Fig. 11, are first prepared so as to have a good welding fit. The stellite should then be placed back toward the tail of the shank and the shank

preheated in a furnace or forge up to 1700 deg. F. or 1800 deg. F.[1] The stellite should be a very dull, almost invisible, red. When the proper temperature has been reached, the shank should be removed and the welding surface cleaned with a file or wire brush to remove any scale that has formed, and a layer of the Tip-It welding compound sprinkled on this welding surface. The stellite tip is then put in place and the tool heated up to between 2000 deg. F. and 2100 deg. F. when the welding compound will flow. This will be indicated by a slight blue flame. When the welding temperature has been attained, the tool should be subjected to light pressure, approximately 50 lb. per square inch. A small air press, an arbor press, a screw press, or vise, turned up vertically, can readily be used for this purpose.

Care should be taken that there is plenty of coke bedding under the tool in a coke fire or forge. When using a gas or oil furnace, oxidation sometimes takes place when the flame strikes the tool directly. Oxidation can be overcome by placing a couple of bricks in the furnace to divert the flame.



FIGS. 7 TO 11. EXAMPLES OF WELDED TOOLS

Figs. 7 and 8—Welding stellite tips to steel shanks. Fig. 9—Welded tools for use in Lo-Swing lathe. Fig. 10—Welded tool for use in Potter and Johnson automatic lathe. Fig. 11—Method recommended by the author for welding stellite tips to steel shanks.

Besides the arc and oxy-acetylene welding processes, butt-welding and welding with Tip-It, many ways of fastening stellite tips to carbon-steel shanks have been tried with varied success. Brazing with copper and brass, both in sheet and powdered form, has been used. The writer, however, does not recommend copper or brass, as the results are too uncertain.

The Question of Coolants

The question of coolants is often raised; and as a general rule a coolant should not be used with stellite tools as they cut far better under a dull red heat than when cold. It is the writer's experience that Taylor's findings, that an increased speed can be obtained by using a coolant, is maintained for stellite. Where a coolant has been tried unsuccessfully the trouble can be invariably traced to the fact that the machine was not capable of giving the increased speed or standing the extra "gaff" necessary to create enough heat to the tool for it to maintain its cutting edge and consequently an abrasive action occurred. The above conditions were conspicuous in plants manufacturing shells. On the smaller machines it was generally not advantageous to use a coolant, while on the larger and stronger machines a coolant often worked to distinct advantage. These results have also been noted under commercial conditions with cast and malleable iron, as well as steel, except of course that the amount of increase in speed will vary accordingly.

[1]Stellite is not affected by heat until a temperature of over 2200 deg. F. is reached, after which it will melt rapidly.

The Williams Internal Gear

To the Editor:

The discussion on page 1083, Vol. 51 of the *American Machinist*, relative to the Williams internal gear is interesting, but Mr. Trautschold's reply does not fairly answer the objections to his original statement. He states that driving near the wheels makes the transference of power more economical than in the case of worm-drive transmissions. Tests by David Brown and Lanchester indicate efficiencies of 96 per cent for a worm gear. Surely, no internal gear could exceed that efficiency and Mr. Trautschold states plainly that the spur gear is more efficient than the bevel gear.

In Mr. Trautschold's internal-gear axle there are two sets of spur gears and one set of bevel gears transmitting the power, in the place of a single set of gears used with the worm drive. There are also at least four more bearings in his internal gear drive than there are in the worm-gear drive. As each and every set of bearings or gears absorbs some power, two additional sets of gears and four additional sets of bearings in the internal gear drive must give it a great handicap in competing with the worm drive.

Mr. Trautschold's "homely" comparison indicates that he has confused torque and power. There is no inherent power advantage in having the internal gear fastened directly to the wheel; therefore, if the worm-wheel in a worm-drive axle is larger than the internal gear in an internal gear drive axle, it is possible, by using Mr. Trautschold's "homely" comparison, to prove that the worm drive is more efficient.

With reference to Mr. Trautschold's statement that there is more economy in an internal gear drive, his attempt to figure out the relative efficiency of the worm drive and the internal gear is certainly a most arbitrary determination. His assertion cannot be proved on paper and has never been proved in road or laboratory tests. The worm-drive adherents claim 96 per cent efficiency and the most enthusiastic internal-gear-drive adherents only claim 92 per cent. If the worm drive is more efficient, how can its use entail a greater consumption of gasoline?

The internal gear preceded the worm gear as a truck drive in England. It has been replaced to such an extent that practically all English trucks are now built

with the worm drive. This year more than 65 per cent of all American trucks are equipped with worm drive, which shows an increase over last year. The producer of the highest-priced trucks in America and the producer of the greatest quantity of trucks in America have each standardized on the worm drive. The internal gear drive can be built and can be purchased for fully 25 per cent less than the worm-gear-drive axle. In the face of these figures, would Mr. Trautschold have us believe that the internal gear drive is appreciably superior to the worm drive? If he really thinks so, he has a remarkably poor opinion of the intelligence of American truck manufacturers and users.

The writer has been connected with the manufacture of both worm-drive and internal-gear-drive axles and is familiar with actual tests. He is therefore familiar with facts to offset Mr. Trautschold's theories and cannot refrain from expressing surprise that Mr. Trautschold should make such radical arbitrary assumptions. He is still more surprised to think that he would try to back up his arbitrary figures by stating that he "understands" that axle economies "approaching" his figures have been realized. If his understanding is based on actual figures, it would only be fair to the general public and manufacturers of axles, to give out something more definite.

R. L. MURPHY.

A Compact Storage Shed for Steel Bars

BY PETER F. O'SHEA

The shed shown in the illustration stores a good many various sizes and kinds of steel. Everything is neat, compact, and instantly accessible. The open-work construction, while strong enough to hold a great many tons, admits light to every part of the shed, so that each bar of stock is in plain sight.

Such a shed adjoins the cutting-off room of the tap, die and reamer plant of the Greenfield Tap and Die Corp. It is also used as the main steel storeroom for the other seven plants of the corporation, to which it issues steel on requisition to their branch raw-material stores. Unloading and loading is done in the foreground through a wide double doorway.

Steel requisitioned from the racks as raw material for the adjoining plant is not brought out the front door again, but is taken back through the central asile, which at the farther end opens directly into the cutting-off room.

A trolley rail underneath the ridge pole of the shed, carrying a chain fall, handles the incoming and outgoing steel. The trolley rail extends through the front wall and projects for several feet over the yard, so as to be above the motor trucks for unloading and loading; or the trucks may also back into the shed itself, the floor being flush with the yard outside. Both the floor and the yard in front of the shed are cemented.

Long bars are stored on end in the back of the shed, in vertical compartments. Short bars are racked horizontally, as can be seen, in the forward part of the shed. The bays for short bars are built of hard-wood posts, channel iron and angle-iron anchors. The compartments are 14 in. across the front from center to center, and spaced 4 ft. 6 in. deep from the front of the first row to the front of the next row of posts behind. Holes are spaced up the middle of each post, and through corresponding holes of all the posts in one row is inserted ½-in. wrought-iron pipe. Through the pipe in turn is inserted a ⅜-in. iron rod to back it up and give it strength. These composite rods hold the weight of the steel stock. They are strong, easy to make and inexpensive.

The horizontal bars divide the vertical bays into tiers of compartments in which the steel can be slid in and out very easily.

Records of the contents of the compartments are kept on the side wall in the aisle by the foreman of the steel shed.

These records include not only a perpetual inventory but notations of what compartment each kind and size of steel is stored in, and for what purposes this steel is intended. The destination of certain varieties of steel is also marked on the edge of the compartment.

A STEEL-STORAGE SHED

The vertical bays are designed by numbers, 1, 2, 3, 4, etc., left to right, on each side of the aisle. The horizontal compartments in each bay are lettered from the top down, A, B, C, D, etc.

Permanent tags nailed top and bottom to the edge of the post beside each compartment tell what material the contents are reserved for. The tags on the shipments of steel are left on after they are in the rack, or tucked into the space between the compartment lable and the post, as if into a pocket or envelope. Long bar stock is taken care of farther back in the shed, by standing each rod on end on the cement floor. But to keep the varieties separate and so that every rod will be accessible, this part of the shed is also divided into distinct compartments. Each of the side-aisles serves two bays, one on each side. A bay is divided into skeleton compartments simply by having iron rods project horizontally a short distance from the wall into the aisle, so that two of them catch an armful of bars and hold them from tipping over.

The weight of the steel as it stands on end is entirely on the cement floor. The more compartments there are, the more nearly the steel rods are balanced, and the easier it is to keep them from falling over sidewise on each other. There are no fronts to any of the compartments. Once the steel rod is tipped forward from the back of the compartment, it is free to fall forward into the aisle. Steel is carried in and out vertically. It doesn't need much elbow room to handle steel in this way.

This sort of shed involves the least possible motion, and every piece of steel in it is instantly accessible.

Combined Trimming and Shaving Dies

By FRANK H. STANLEY

In the manufacture of some small machines there are often many parts that are so nearly alike that to make blanking tools for each piece would entail an endless expense. Such pieces can all be blanked by one set of tools and the variations in dimensions and contour may be taken care of by trimming dies built into the same blocks as the shaving dies. In this article the author describes and illustrates in detail some such combinations of dies that are both novel and ingenious.

A PIECE of work involving both trimming and shaving is shown in Figs. 1 and 2. This is a small steel cam with a radius, from center to point, of $\frac{13}{32}$ in. It is used on a calculating machine, and it forms an unusually interesting application of the trimming principle, for the blank is not made from sheet stock, but instead is produced in the screw machine where it is turned out to the form of a disk 0.080 in. thick, with a hub finished to 0.280 in. in diameter, and a hole drilled and reamed through the center to 0.155 in. Thus in the shape of a thin disk it is passed through the press tools for the making of the cam contour instead of being finished by the more conventional process of milling to shape.

The cam is made both right and left hand, one of each being required for each calculating machine. The dies are correspondingly made for right- and left-hand lobes, a duplication of die openings being made necessary by the hub extending at one side of the cam. The disks are placed in the dies with the hub located in the round end of the opening, and the punch, upon descending, removes all of the superfluous metal around the cam by forcing the latter into the die. The cam is pressed down into the die by the punch to a sufficient distance to allow the next blank disk to enter hub down, but with the lower face of the disk resting upon the face of the die.

The construction of the die is shown clearly in Fig. 2. The die openings are located at a distance of $1\frac{1}{16}$ in. apart to allow two blank disks to clear one another when placed for trimming and to permit the punches being made separately with ample size of base for stability. The shape of the punches is seen in the detail, and it will be noticed that each is made with a base 1 by $1\frac{1}{2}$ in. in area and secured by two $\frac{1}{4}$-in. fillister-head screws and two dowel pins of the same diameter.

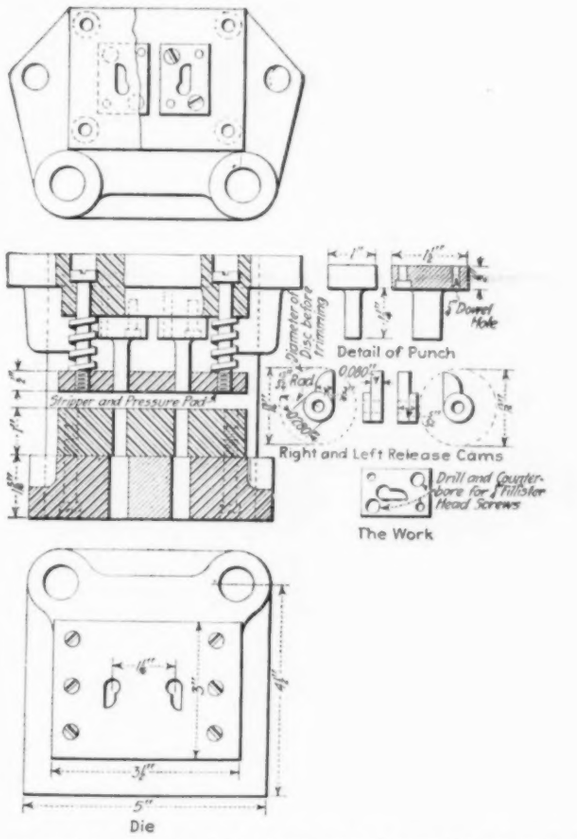


FIG. 2. DETAILS OF WORK AND TOOLS SHOWN IN FIG. 1

The pressure pad and stripper, carried by the punch head, are fitted closely to the punches and are normally held downward upon the work when the slide descends by means of four stiff pressure springs located at the corners on $\frac{5}{16}$-in. screws. The action of the springs and plate upon the upstroke is, of course, to strip from the punches the trimmed off portion of the disk.

The shaving of the cams is accomplished in the dies shown in Figs. 3 and 4.

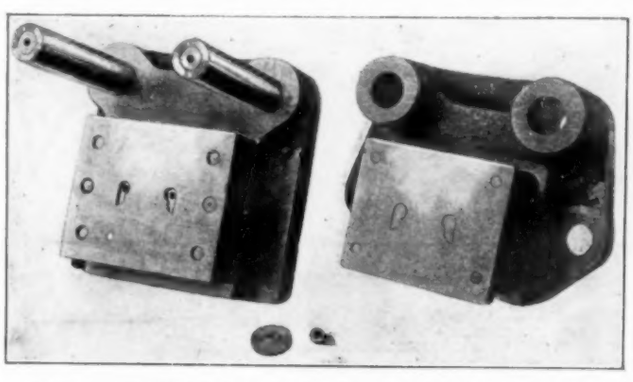


FIG. 1. WORK TO BE TRIMMED AND SHAVED AND THE PRESS TOOLS FOR THE OPERATION

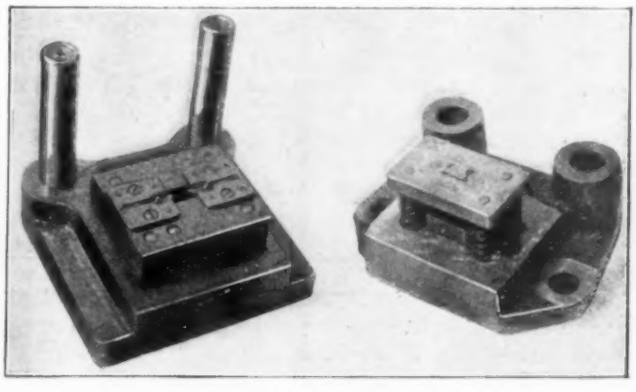


FIG. 3. PRESS TOOLS FOR SHAVING THE CAM

Like many of the tools illustrated in previous articles, the trimming and shaving dies for the cams and those that follow are provided with guide pins or pillars for preserving truth of alignment with consequent accuracy and longevity in operation.

The steel piece in the foreground of Fig. 5 is another example of trimming and shaving work, which is shown in detail in Fig. 6. This small lever, which is blanked from half-hard steel stock, is 0.140 in. thick and prior to reaching the dies shown in Figs. 5 and 6 it has been

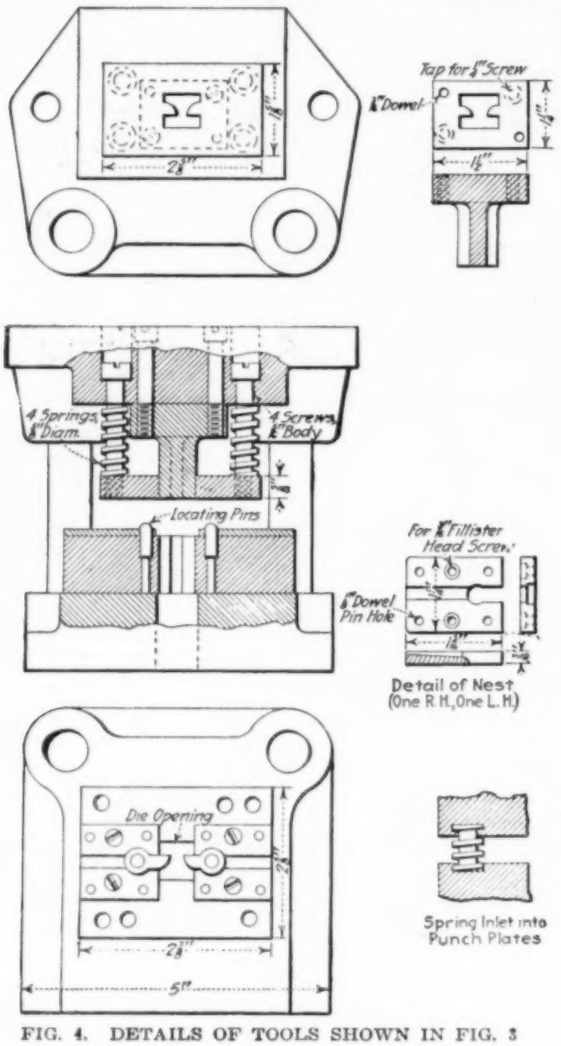


FIG. 4. DETAILS OF TOOLS SHOWN IN FIG. 3

shaved all the way around and pierced in separate press operations. The heel of the lever and the point have been milled down to dimensions given, and the object of the operations in the present dies is to trim the round end to an angle, as shown at *A*, Fig. 7, and shave it accurately.

The die is so made that the right-hand side of the opening, Fig. 6, is adapted for trimming the work to form the V point, while the opposite side is for the shaving operation, as indicated in the plan view. The blank, No. 1, at the right, is shown as it appears after trimming, and the other piece, No. 2, occupies the shaving position. After the latter is removed, the blank at the right side is transferred to the left and a fresh blank placed in position 1 for trimming. Thus at each stroke of the press one piece is trimmed and another shaved. The latter operation removes about 0.010 in. of metal from each side of the angular point.

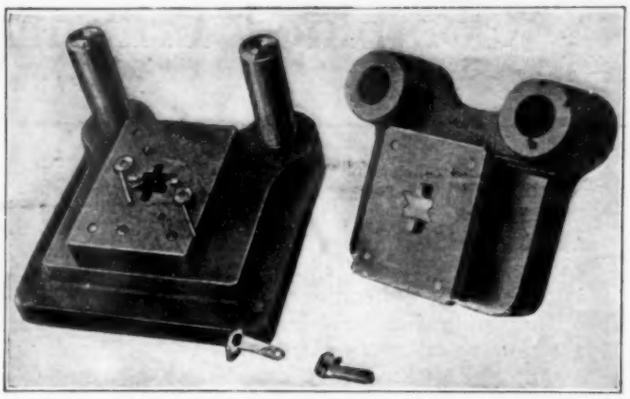


FIG. 5. PRESS TOOLS FOR TRIMMING AND SHAVING THE LEVER

The method of holding the work at each side of the die is to slip it over two locating pins which fit the small round hole at the end and to oblong opening in the head of the work, and then swing the eccentric binder *B* by the small handle, to secure the piece in place.

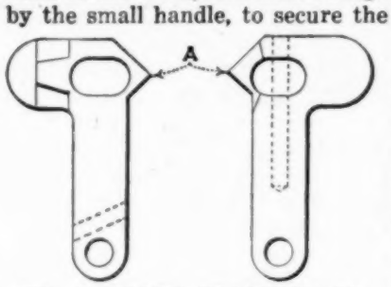


FIG. 7. WORK PRODUCED BY TOOLS SHOWN IN FIGS. 5 AND 6

The punch is illustrated in plan and by several elevations. It has two guiding extensions *CC*, which are ¼ in. longer than the cutting face and which enter the corresponding guide openings *C'C'* in the die to that depth before the cut is started. The shoulders *DD* fitting between sides *D'D'* in the die still further steady the punch for the trimming and shaving cuts. The pressure pad or stripper fitted over the punch is controlled by four springs under the corners.

Another form of shaving die combined with piercing tools is illustrated in Figs. 8 and 9 for operators on the two rocker-arms shown in Fig. 10. These two steel

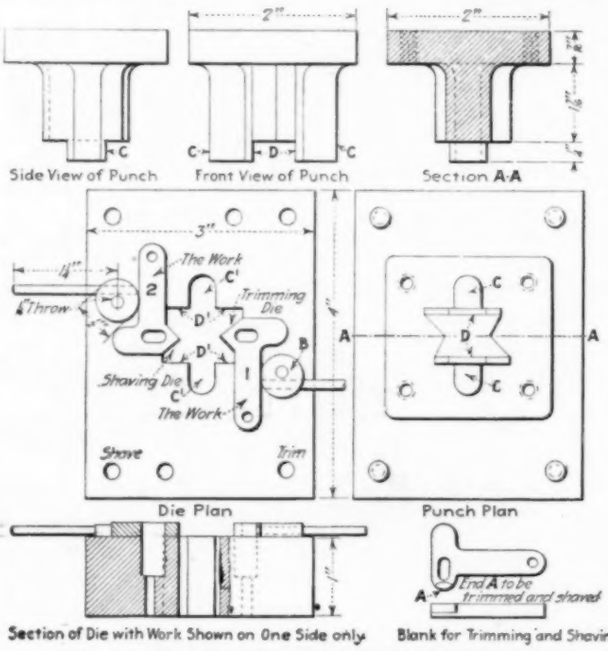


FIG. 6. DETAILS OF TOOLS SHOWN IN FIG. 5

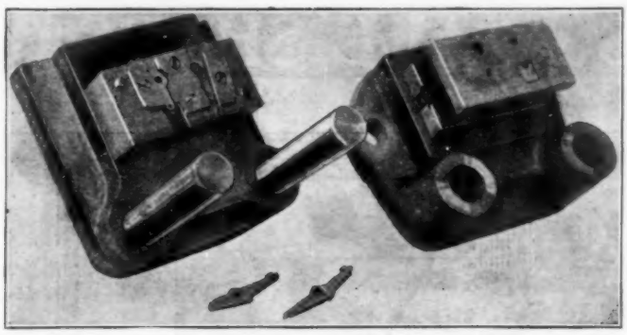


FIG. 8. COMBINED SHAVING AND PIERCING TOOLS

pieces are blanked from $\frac{3}{32}$-in. stock and are alike as they come from the blanking dies. The trimming and piercing dies in the illustrations are then used for piercing one-half of the lot of rocker-arms as at *X*, Fig. 10, and for trimming off and piercing the other half of the lot to make the shorter piece *Y*.

The drawing of the die and punch plate in plan view, Fig. 9, shows the method of placing two blanks at once in the nests on the die face.

Thus the trimming punch A^1 trims off the end of one of the rocker-arms at *A*, the portion removed being

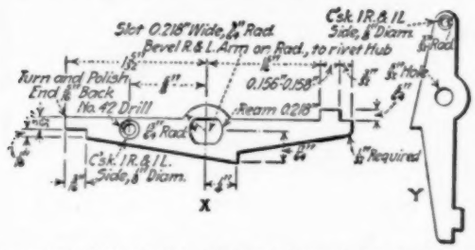


FIG. 10. THE WORK TO BE TRIMMED AND PIERCED BY TOOLS SHOWN IN FIGS. 8 AND 9

indicated by dotted lines. The punch B^1 and the die B^2 pierce the hole *B;* the punch C^1 and die C^2 pierce the larger hole *C*. The rocker-arm *X* at the left is pierced by punches D^1 and E^1, which act with dies D^2 and E^2, to form the holes *D* and *E*. The end of the work in this side of the die is not trimmed.

The trimming punch A^1, it will be noticed, enters into and is guided by the slotted opening A^2 in the rear of the die. It performs its work before the piercing punches enter the blanks. The die hole B^2 for this end of the short rocker-arm is formed in the trimming die itself, as shown by Fig. 8, but the other piercing dies are in the form of bushings which are inserted in the die plate.

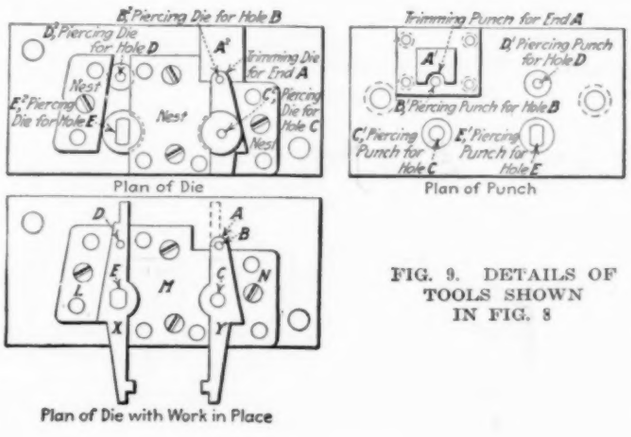


FIG. 9. DETAILS OF TOOLS SHOWN IN FIG. 8

The nests for the two pieces worked in these dies are made up of three plates *L*, *M* and *N*, which are secured by screws and dowels to the die face. These nest plates are made to match the straight edges of one side of the work and the tapered edge on the opposite side. The wide center of the work is blanked to a radius of $\frac{11}{16}$ in. and this circular portion fits into a similarly shaped seat in one of the edges of the middle nest plate *M* to locate the piece endwise.

Practical Points in Depreciation

BY L. L. THWING
Formerly Appraisal Expert for Machine-Tool Section of the Air Service

In an article on page 761, Vol. 51, W. W. Pollock has followed what is apparently a general custom of making scrap value one of the factors in the depreciated value of a machine. It is not disputed that iron and steel have a definite, if fluctuating, scrap value but there are other factors which if given due consideration will indicate that this practice is a refinement not warranted by the accuracy that can be maintained in the more important factors of depreciation.

Briefly, it is only necessary to point out that the average per pound price of machine tools is certainly not less than thirty cents, while an average price of No. 1 machinery scrap is one and one-half cents per pound. Thus the gross scrap value of a machine tool is less than 5 per cent of its replacement value and any appraiser who thinks he can hold his other errors within this limit is deceiving himself and his client.

A detailed analysis will show this even more plainly. After it has been decided to scrap a machine, the next move in actual practice is to have the millwright's gang come in and dismantle it, take down the countershaft, put the machine on skids and take it away.

The price of scrap metals as quoted in the trade journals is a consumer's price, f.o.b. cars. The local dealer who buys your scrap bears all the expense of collection and separation of steel and cast-iron parts, cost of transportation, and breaking into pieces small enough for the foundry to use. You may be sure that all of this will be reflected in the buyer's offer.

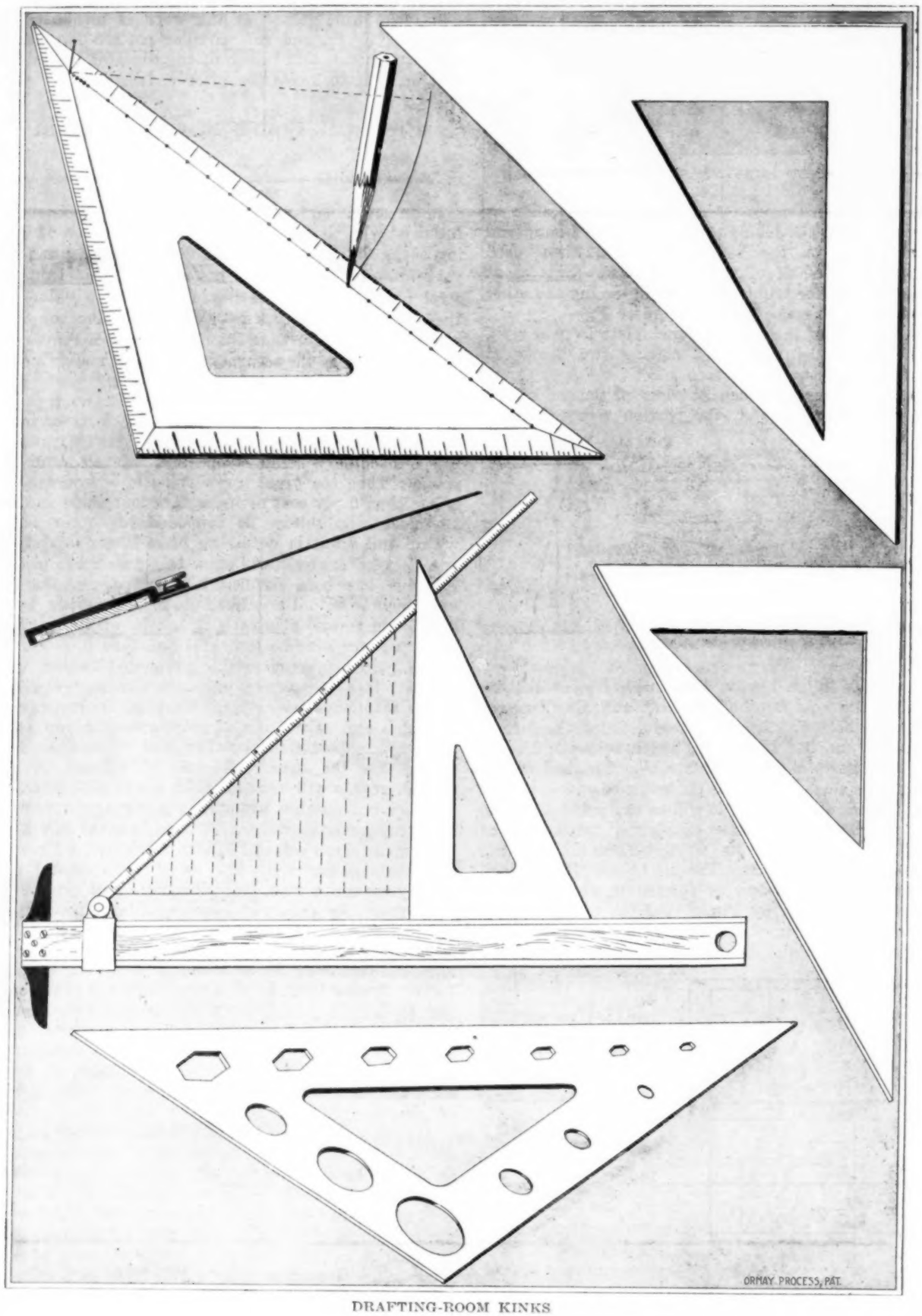
To give a specific example, a ten-year-old 14 in. x 6 ft. engine lathe weighs 1500 lb., and at $30 a ton has a gross scrap value of $22.50. However, for reasons previously enumerated, $15 would be a liberal offer from your scrap man. To dismantle and remove the lathe from the shop will require at least three hours for two men at 50 cents an hour. Allowing 100 per cent overhead, and deducting this cost from $15, we have a balance of $9 as the net scrap value of the lathe. A new lathe of this type sells for $700 today, and $9 is approximately 1.3 per cent of that amount.

Assuming that a machine has been depreciated for wear, obsolescence, and lack of utility—a total of 40 per cent: Shall we now make an addition of 5 per cent, assuming that this is the net scrap value, in hope of securing further accuracy?

Appraisal is not an exact science. It may be that the true depreciation is either 35 or 45 per cent. If we add 5 to our original 40, our final result will be 45 per cent, which is either exactly correct or a 10 per cent error. In other words, if you attempt to introduce an allowance or correction of any percentage which is equal to or less than your limits of error you are gambling with results on a "double or quits" basis.

FOR SMALL SHOPS *and* ALL SHOPS

By J. A. Lucas



DRAFTING-ROOM KINKS

US ARMY ORDNANCE NEWS

Manufacture of Artillery Range Finders—III

By GEO. H. THOMAS

It is necessary that the dials and scales, which in range-finding apparatus enable the gunner to determine his angles of elevation and site, shall represent the highest attainable degree of accuracy, and to that end the special tools and methods herein described were devised. (Part II appeared in our last issue.)

BECAUSE of the extreme degree of accuracy required in the graduated scales of range-finding apparatus and the impossibility of preventing small errors from creeping in during the manufacturing operations, the graduating of all such scales is made an after operation, being accomplished by means of special precision machines and devices for indexing and checking after the apparatus is otherwise finished and partly or wholly assembled. The principle of checking the smaller radius of the graduated scale against the amplified reading of a master scale is employed in all these devices. The illustration, Fig. 26, shows the French make of gun sight mounted upon the trunnion of a false gun carriage in the same manner that it would be mounted in actual service. The straight-edge *A*, to which is attached the gunner's quadrant *B*, represents the barrel of the actual gun, the elevation of which is determined by the rotation of the trunnion of which the casting *C* is an extension. The large graduated dial *D*, mounted upon the same axis, measures in degrees this angle of elevation and is checked at the major points by the gunner's quadrant. These positions were then verified by bringing the optical lunette of the range finder to bear on a distant target, the position of which has been determined by computation and measurement. As each major setting (5 deg. of arc) was obtained and checked, a line was scribed on the drum scale, which may be seen through the window in the housing at *E*.

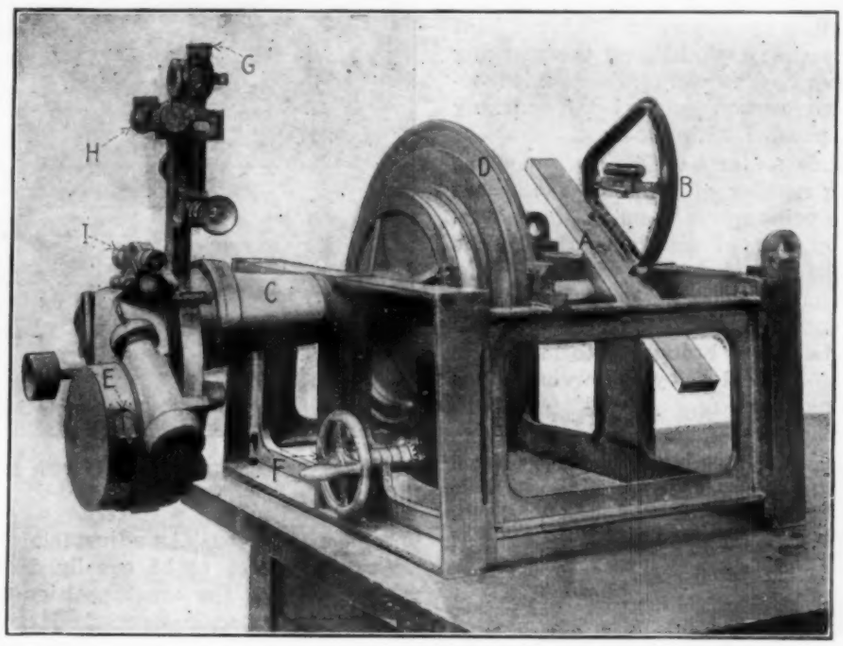


FIG. 26. FRENCH GUN SIGHT MOUNTED ON FALSE GUN FIXTURE

Thus, three independent means of locating the divisions were available, and if any discrepancy was evidenced, it was investigated and the fault corrected before marking the drum scale.

This method eliminated the possibility of accumulated error, which might have been caused by inaccuracies in the manufactured parts of the mechanism, by excluding from the process all consideration of the mechanical movements and establishing the divisions directly from the position of the gun. The trunnion of the gun was turned from one position to another by means of the handwheel *F* through the medium of the bevel and worm gearing and their connecting shafts. Upon the range finder at *G* and *H*, and upon the angle of site *I*, are thimbles and dials with micrometer graduations which enable the gunner in actual service to direct the movements of the gun with extreme accuracy. The details of these parts are shown in the line drawing, Fig. 27

In ordinary methods of manufacture it would be permissible to roll the graduations upon these parts by contact with a master or type dial but such methods would give results far from the degree of accuracy required in this case; therefore, each dial was individually engraved upon the apparatus shown in Fig. 28.

The graduating device was improvised upon a disk

ARMY ORDNANCE NEWS

grinding machine, by the use of a tail block from a pair of milling-machine centers which was opposed to the center in the disk; a turret slide from a screw machine; a Rivett slide rest; a 24-in. disk graduated as the work required; and a magnifying glass to align correctly the graduation marks with the stationary indicator located at the top of the disk. The disk was turned by a small friction wheel operated by the handwheel to be seen at the left end of the machine table.

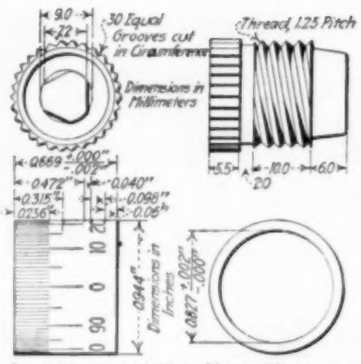


FIG. 27. MICROMETER THIMBLE, SHOWING THE GRADUATIONS

The turret slide is operated in a direction to and from the face of the disk by means of the large bent handle, and the Rivett slide rest, holding the marking tool, is mounted upon it. The work is supported between the two opposed centers so that the marking tool travels in a line parallel with its axis.

A stop-pin on the slide contacts with a disk upon the base, this disk having notches of different depths cut in its periphery at the point where the stop-pin strikes. A ratchet operated by a pawl attached to the slide turns this disk one step at each movement of the slide, thus providing for a longer mark at each fifth, and a still longer mark at each tenth division. The graduations on the master dial were brought into alignment with the line on the indicator by observing them through the magnifying glass.

The methods employed by the French in putting in the marks representing the subdivisions of the drum scale were clever and ingenious. The machine is shown in Fig. 29. The operation requires a considerable degree of skill and experience.

The machine has an indexing spindle turning upon a vertical axis and carries on its upper end a large dial which is accurately graduated. A precision worm gear is integral with this dial and its worm is under control of the operator's left hand through the compensating device below *A*. The work to be graduated is held upon the upper surface of the master dial and the engraving is done by a tool supported from the overhanging arm.

The worm gear on the master dial has 360 teeth and upon the worm shaft is a micrometer thimble having 60 divisions, thus giving direct readings in minutes of arc. The compensating device consists of a threaded sleeve of comparatively coarse pitch which determined the position lengthwise of the worm shaft. A gear upon the end of the sleeve is provided with adjustable stops which are so set that, by turning the sleeve the distance between stops, any error in any major division

FIG. 29. FRENCH MACHINE FOR SUBDIVIDING THE DRUM SCALE

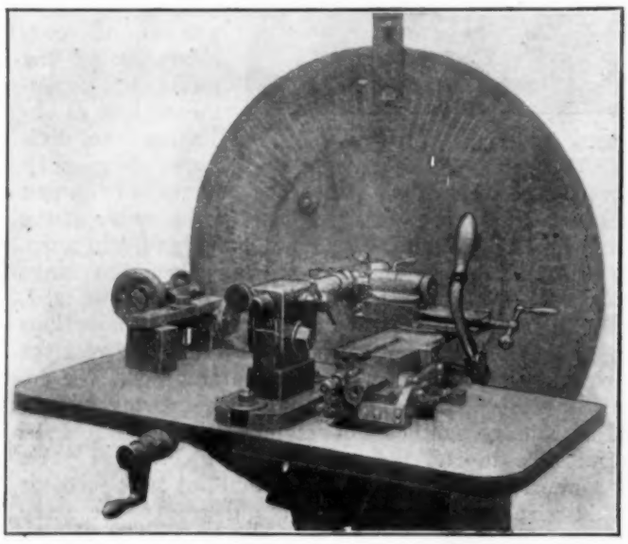


FIG. 28. FIXTURE FOR GRADUATING THE MICROMETER THIMBLE

is compensated for. An adjustable scale upon the sleeve allows this error to be equally distributed over each major division, the exact position of whose limits is determined by vernier upon the large dial.

How It Is Done in America

While the French methods are interesting and instructive, a comparison of them with those followed in America to accomplish the same result may be of interest.

The American device, shown in Figs. 30 and 31, is double; two of the devices being mounted on the same baseplate. A Rivett headstock fastened to one corner of the plate holds the work by means of a mandrel and collet. Above the headstock, on a casting which sets over the latter, is mounted the cross-slide of a screw machine in such manner that its line of travel is parallel to the center line of the headstock spindle. To this cross-slide is attached a slide-rest so positioned as to give a movement transversely to the center line of the spindle and also a vertical movement; thus a tool held by it has movement in three directions at right angles.

ARMY ORDNANCE NEWS

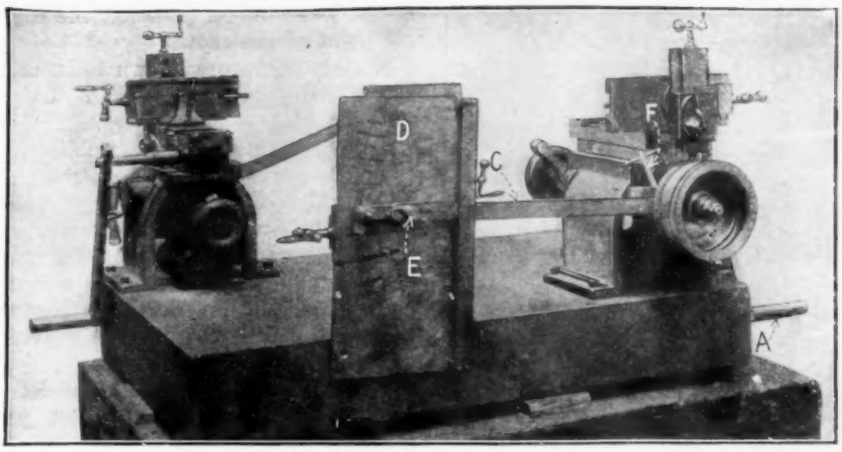


FIG. 30. AMERICAN DEVICE FOR SUB-DIVIDING THE DRUM SCALE

The movement of the slide which is parallel to the center line of the spindle is of course the one that provides for the marking, and is made by means of the lever *A*, Figs. 30 and 31, the same system of stops being used for making long and short marks as is described in reference to Fig. 28, the arrangement being much more clearly shown in Fig. 31 at *B*.

The spindle of the headstock is free to turn but the work is clamped in the end of the radius bar *C* (not visible in Fig. 31).

A second screw-machine cross-slide mounted to the left of the headstock has a horizontal movement to and from the work spindle and upon this slide is fastened the large index plate *D* having a row of holes distributed over an arc, the radius of which is approximately ten times that of the drum to be marked.

This radius is, however, variable, the index plate being moved to or from the work by means of the cross-slide upon which it is mounted, such movement being allowed by the radius bar by reason of the slip joint *E* near its outer end. The clamp holding the work in the radius bar may be loosened by turning back the wrench *F*.

With the index pin in the first hole in the master plate the marking tool is brought into coincidence with one of the major divisions already established on the drum by the means previously described. The index pin is withdrawn and placed in the last hole of the master plate, when, if the marking tool does not now coincide with the *next* major division, compensation is made by increasing or decreasing the length of the radius bar, and altering the position of the master plate to correspond. This cut-and-try method is continued until the difference between the first and last positions of the pin exactly corresponds to major divisions on the drum, after which it is a simple matter to subdivide the latter into the number of parts represented by the number of holes in the master plate. The operation of setting for, and graduating a single drum is about 30 minutes.

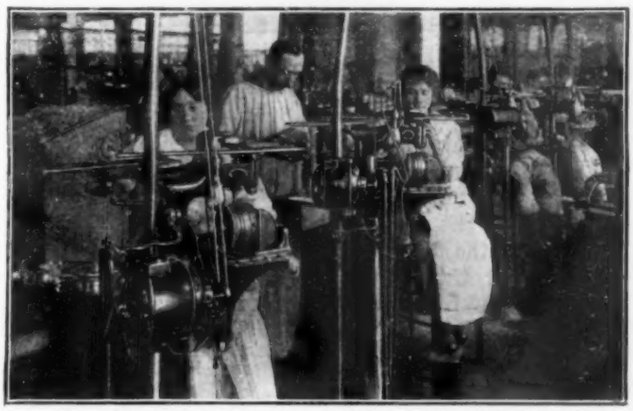


FIG. 32. FRENCH MACHINES FOR ENGRAVING NUMBERS ON THE DRUM SCALE

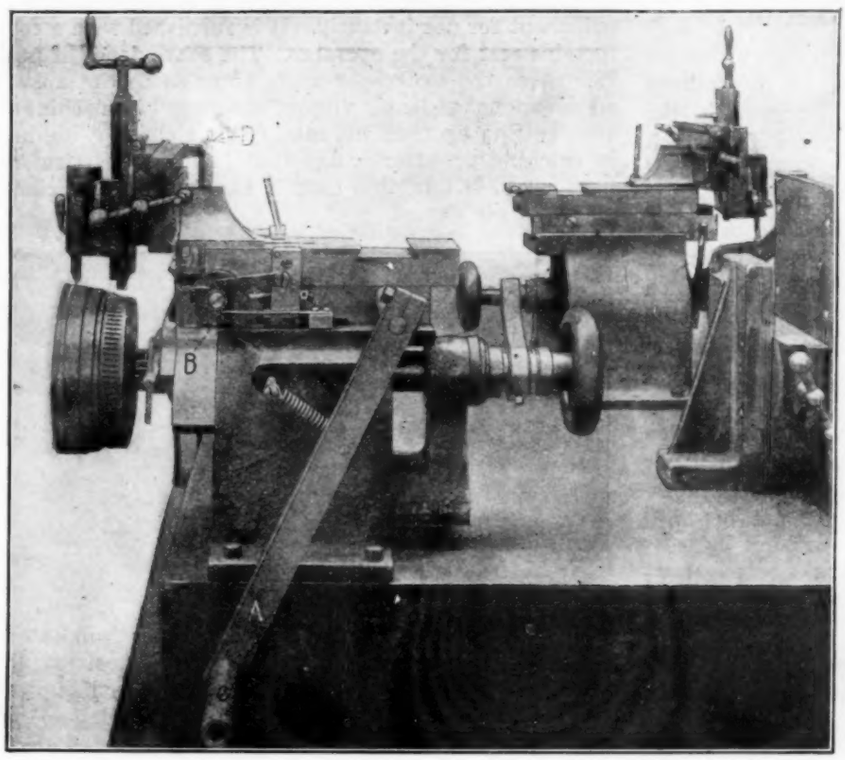


FIG. 31. AMERICAN DEVICE FOR SUB-DIVIDING THE DRUM SCALE

In engraving the figures on the drums the French so classified the work and distributed it among several engraving machines that each machine was confined to certain figures, the work passing from one machine to another until the engraving was complete. By this method the amount of skilled labor required was reduced to a minimum, the machines being so arranged and set as to make mistakes practically impossible. The battery of engraving machines and their operators are shown in Fig. 32.

The method employed in this coun-

ARMY ORDNANCE NEWS

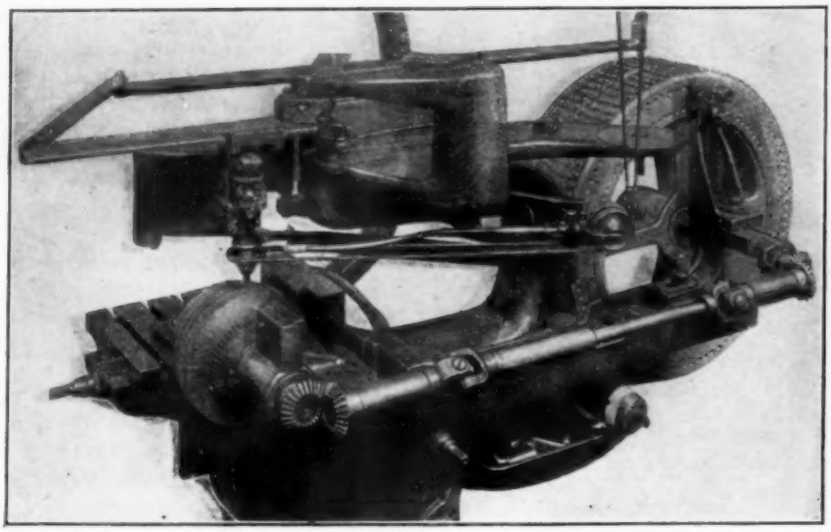


FIG. 33. THE AMERICAN METHOD OF ENGRAVING THE DRUM SCALE

try provided for the completion of the engraving upon a single machine which may be seen in Fig. 33. An aluminum master drum was made a fac-simile upon a large scale of the drum to be engraved. The indexing pins locked the master drum by means of holes in its face while the drum to be engraved was connected with the master through the gearing shown in the foreground, making its movements coincident with the master.

The time required to engrave a drum with this machine was reduced 50 per cent. over the previous method.

Rules for Autogenous Welding

The following rules, adopted by the Committee on Standards for Locomotives and Cars, U. S. Railway Administration, for the purpose of preventing the abuse of autogenous welding for purposes for which it is not well adapted, have been sent to the regional directors by Frank McManamy, assistant director of the Division of Operation, with instructions to direct all roads to observe the rules in the construction or repair of locomotive boilers, so that any failures which may have been caused or contributed to by unrestricted or improper use of autogenous welding may be prevented:

1. Autogenous welding will not be permitted on any part of a locomotive boiler that is wholly in tension under working conditions, this to include arch or water bar tubes.

2. Staybolt or crown stayheads must not be built up or welded to the sheet.

3. Holes larger than 1½ in. in diameter when entirely closed by autogenous welding must have the welding properly stayed.

4. In new construction welded seams in crown sheets will not be used where full size sheets are obtainable. This is not intended to prevent welding the crown sheet to other firebox sheets. Side sheet seams shall be not less than 12 in. below the highest point of the crown.

5. Only operators known to be competent will be assigned to firebox welding.

6. Where autogenous welding is done the parts to be welded must be thoroughly cleaned and kept clean during the progress of the work.

7. When repairing fireboxes a number of small adjacent patches will not be applied, but the defective part of the sheet will be cut out and repaired with one patch.

8. The autogenous welding of defective main air reservoir is not permitted.

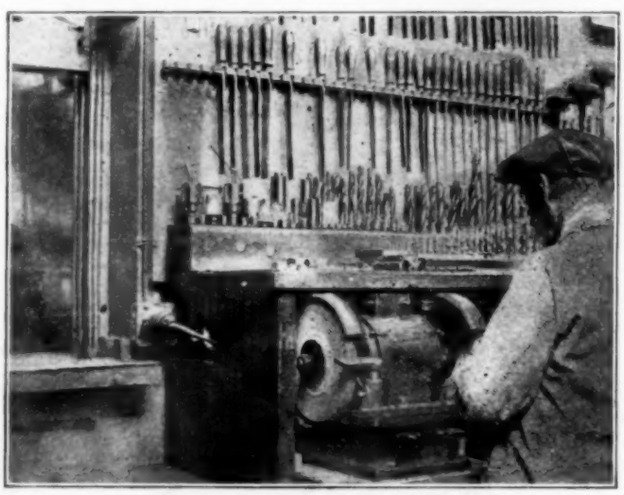
9. Welding rods must conform to the specifications issued by the Inspection and Test Section of the United States Railroad Administration for the various kinds of work for which they are prescribed, which specifications will be issued later.

A Toolroom Convenience

By Fred D. Hood

The contrivance illustrated may savor of pampering the toolkeeper, but since anything which adds to his convenience usually enables him to give better service, it is not only justifiable but good business.

The machine illustrated is a tool grinding machine with two 10 x 1-in. wheels and is used for general light tool grinding. Mounted on a sliding shelf under a bench as close as possible to the toolroom window, it can be pulled out for use instantly. It is furnished with a comfortable seat for the operator. The convenience of position saves the toolkeeper many steps as he can answer all questions, at least, without stopping his machine or even getting up from his seat. This alone is a big help in catching up after a day that has been particularly hard on tools. In this case it has increased efficiency about 25 per cent.



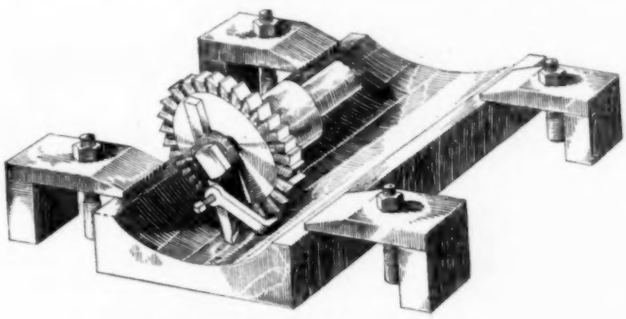
A TOOLROOM CONVENIENCE

An Improvised Fly-Cutter

BY GUSTAVE REMACLE

Having to machine a piece of material 6½ in. long and 4 in. wide as shown in the sketch, a toolmaker saved considerable time by machining the concaved surface in the Van Norman Duplex milling machine.

When the block had been machined to the required outside dimensions, a line was marked off with a height gage, to be used later when indicating the center of the piece, which was then roughed out in the shaping machine; after which it was located upon the table



AN IMPROVISED FLY-CUTTER

of the milling machine and lined up with the spindle of the machine. A milling cutter 3½ in. in diameter was selected and a bench lathe tool of high-speed steel was clamped to the cutter.

By means of a ground parallel and height gage, the tool was adjusted to cut the desired radius. This done it was only necessary to machine the piece to the required depth and the job was completed. The slotting cutter held the tool rigidly and served its purpose well. The inclination of the body of the tool served to prevent chattering or digging in. The tool was ground at the cutting edge so as to provide top rake.

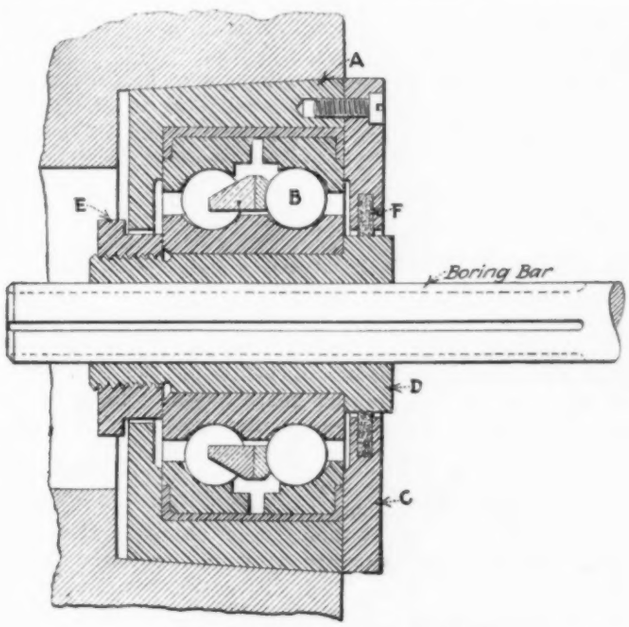
Ball-Bearing Pilot Bushing for Boring Bars

H. M. FAY

Most of us are familiar with pilot bushings held in chucks or faceplates on lathes or turret chucking machines. These are generally made a running fit for the boring-bar pilots and forced in the jaw side of the chuck.

The illustration shows a bushing for this purpose in which a standard commercial ball bearing of the double-row type for taking radial and thrust loads is used. The essential parts of this construction consist of a shell *A*, driven in the chuck in the usual manner, in which the ball bearing *B* is contained, being held in place by the plate *C*. The outer ring of the bearing is a snug fit in the shell.

Mounted in the inner shell is a bushing *D* and this is securely clamped therein by the screw collar *E* while a felt washer at *F* keeps dirt and chips out of the bearing. The boring bar is a sliding fit in the bushing *D* and it is apparent that the advantage of reduced



BALL-BEARING PILOT BUSHING

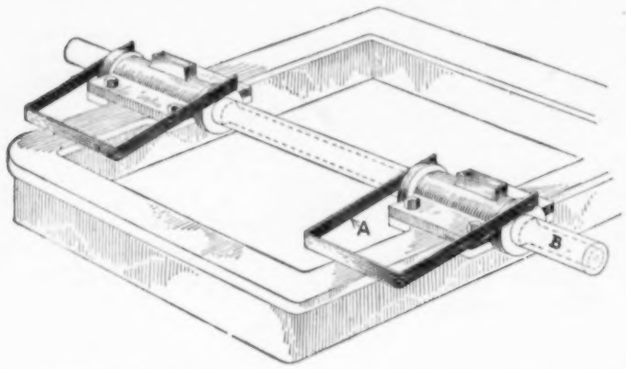
friction, common to ball-bearing constructions, applies to pilot bushings so constructed. This results in much less wear of the boring-bar pilots as they merely slide in the bushings and do not revolve. The bushings *D* are readily removable to accommodate different diameters of boring bars.

Device for Babbitting Bearings

BY JOHN VINCENT

For babbitting bearings it is customary to use an arbor with adjustable collars which are brought up against the ends of the boxes and held in place by means of setscrews to prevent the molten babbitt from spilling out. This saves the time required for sealing the ends of the boxes with putty which is necessary when collars are not used. The collars are often made with shoulders on their inside faces which fit into the

outer ends of the boxes a fraction of an inch and serve to support the arbor reasonably near to the center of the boxes. The setscrews take time to set up and will eventually make rough spots that add to the difficulty of removing the arbor; therefore, one shop has substituted the steel springs shown at *A* in the accompanying illustration, which are easy to put in place and hold the collars firmly against the boxes. These were



DEVICE FOR HOLDING COLLARS ON BABBITTING ARBORS

made of flat spring steel stock, suitably tempered, after having been bent to the shape shown.

Another feature for arbors that are to be used continually on the same job is the relieving of the part between the bearings and on one outside end as shown by the dotted lines *B*. This saves considerable time in the removal of the arbor after the bearing metal has set.

Formulas for Gear Plug Gage

By F. W. Shaw

C. H. Dengler gives formulas on page 76, Vol. 51, *American Machinist* for use in calculating the diameters of the plugs used in gaging gears by the plug method and for ascertaining the radial distance to the outside of the plug. He has erroneously assumed that the center of the plug, when this makes contact with the tooth flanks at the pitch circle, lies within the pitch circle. Since, however, it lies without the pitch circle, the published formulas are evidently wrong. The dotted circle *K*, struck from a point *P* within the pitch circle, must obviously cut the tooth flank if it meets the latter at the point *Q* at the pitch circle.

Now, two curves in mutual contact, and not cutting, can have their centers or instantaneous centers only in the line which lies at right-angles to their common tangent (as *T*); that is, in the case in point, in the line *AB*. The only point at which the center of the plug can be located, if it is to touch at both *C* and *Q*, is at *B*.

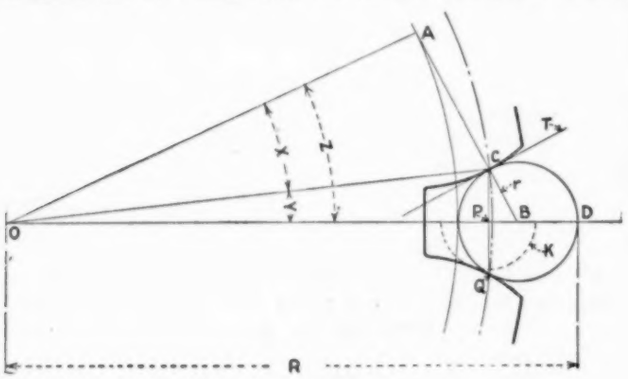
In the diagram herewith, the angle *X* is known, for it is the pressure angle; the angle *Y* can be ascertained for it is four right-angles divided by four times the number of teeth or 90 deg. divided by the number of teeth; the angle *Z* is obviously the sum of angle *X* and *Y*. If we determine *OA*, the radius of the base circle, *OB* and *R*—hence *OB*+*R*, the required data—can readily be calculated. Now $OA = OC \cos X$ (*OC* being the pitch circle radius and therefore known).

The formula for the plug diameter is:

Diameter of plug
$= 2r = 2\ (AB - AC)$
$= 2\ (OA \tan Z - OC \sin X)$
$= 2\ OC\ (\cos X \tan Z - \sin X)$; eliminating *OA*, to avoid calculating it. (1)

Radius over plug
$= R = OB + R$
$= AB \operatorname{cosec} Z + R = OC \cos X \tan Z \operatorname{cosec} Z + R$
$= OC \cos X \sec Z + R$ (2)

It is interesting to note that gears with even numbers of teeth can be checked with an ordinary micrometer or vernier by using two plugs resting in opposite spaces. For gears with odd number of teeth, the method is also available if one calculates the plugs occasioned by the plugs not being diametrically opposite—quite a simple calculation by the way.



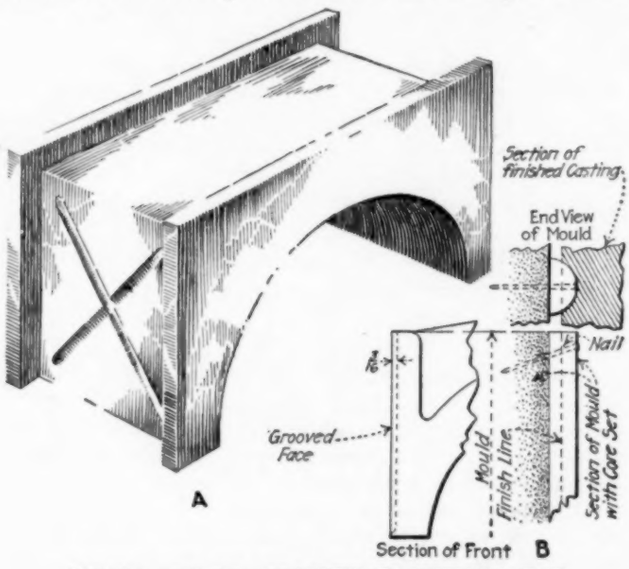
GEAR-GAGING PLUG DIAGRAM

Coring Oil Grooves Instead of Chipping Them

By M. E. Duggan

The other day I saw a machinist cutting the oil grooves in the two sliding faces of a large journal box with a chisel. These grooves were $\frac{3}{16}$ in. deep, $\frac{1}{2}$ in. wide, totaling 5 ft. in length, and were as shown at *A* in this illustration. All this labor and time could have been saved had the grooves been made in the casting in the foundry.

The job may be done in the foundry in the following simple way: One-half of a core $\frac{3}{4}$ in. in diameter is fastened to the sides of the mold with nails as shown at *B*. Marking the location of the grooves on the pattern is all that is required. If but one casting is wanted



CORING THE OIL GROOVES IN JOURNAL BOX

a single line drawn through the center of the groove or grooves will answer the purpose just as well as a "black and white" varnish finish.

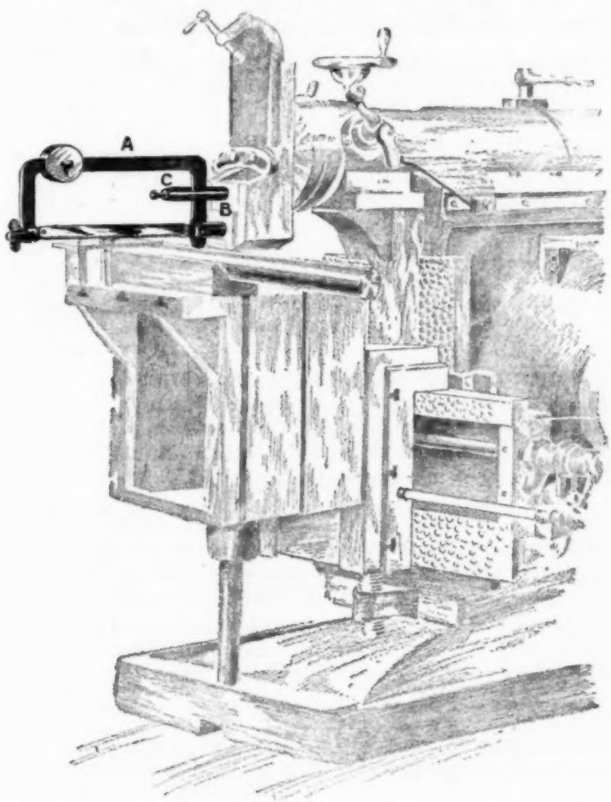
For these oil grooves no special corebox is necessary; the cores are taken from stock. Not all patternmakers know this, as was clearly shown in the foundry a short time ago where such a pattern was fitted with core prints, and coreboxes made, one for the straight part of the grooves and another to make the jointed cross-section.

Converting a Shaping Machine Into a Power Hacksaw

By Wm. Denton

The man in the small job shop has to exercise considerable ingenuity to get out work that would present no problem at all to the foreman of a fully equipped establishment.

For example: our little shop did not have a power hacksaw, as our sawing jobs were limited to an occasional small piece that could quickly be cut off by hand. When one day we faced the necessity of cutting



HACKSAWING ATTACHMENT TO SHAPING MACHINE

off a large number of pieces from fairly sizeable bars we wanted a power saw, and we wanted it very badly.

Wanting a thing, however, is far from getting it, as we have previously discovered, so the work was started in a shaping machine with the usual results: constant attendance, of course; snagging and occasional breaking of the tool, caused by slippage of the work in the vise; exasperation and intense desire to do it some other way.

The expenditure of a little gray matter and a few hours work served to make a fairly serviceable hacksaw out of the shaping machine as illustrated herewith.

A frame *A* was first made to take a 12-in. blade. A block *B* was fitted to the clapper box in place of the clapper, and an extra hole drilled through the box and block parallel to the taper-pin hole. A slotted arm *C*, which was forged integral with the block, formed a yoke to which the rear upright member of the frame was fitted, and a cap, closing the end of the slot, contained a setscrew which acted as a stop to prevent the saw frame from falling too far.

Adjustable weights were made to slide on the upper member of the frame. The feed of the saw was entirely by gravity and its downward movement was limited by the setscrew. The vertical slide of the machine was used only to adjust for different sizes of work to be cut.

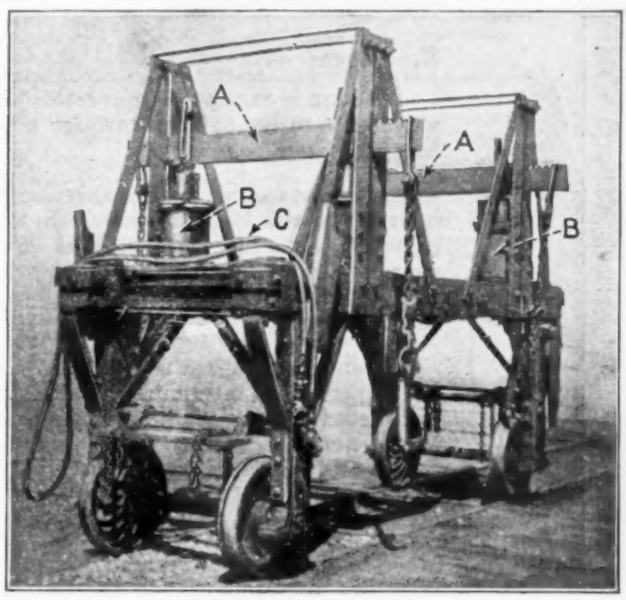
The converted machine could not compete in speed with a regular power saw, but it required no attention beyond setting for each piece and thus proved a valuable acquisition to a shop not equipped with the latter machine.

A Handy Rig for Transferring Car Trucks

By Robert Bruce

The illustration shows a handy rig for handling car trucks and for transferring them from one track to another.

A truck can be rolled underneath the rig from any cross track and then hoisted clear from the rails by



RIG FOR TRANSFORMING CAR TRUCKS

the hooks and chains attached to the equalizing bars *AA*. Hoisting is done by compressed air delivered to four cylinders whose pistons are attached to the equalizing bars.

Two of the cylinders may be seen at *BB*. Air is supplied through the hose *C* which can be attached to one of the many air outlets in the shop yard.

With a truck hoisted clear from the rails the whole affair can be rolled on its track and the truck delivered to the shop or placed on any one of the cross tracks in the yard.

This rig is in use in the yards of the Chicago shops of Chicago & Northwestern Railroad.

What Real He Men Think *of the* Compulsory Metric System

THE man who wrote this letter is a keen, responsible business man with a broad grasp of the situation and its relation to our Domestic and World Trade. He is typical of many others of the same opinion, who have been responsible for making the United States the greatest machinery-building and manufacturing nation in the world.

American Machinist. January 20, 1920

Attention Mr. Ethan Viall, Editor

Gentlemen:

We are in receipt of your letter of the 16th and note what you say regarding the movement to try to force through a law in the next session of Congress, making the Metric System compulsory.

In reply, would say that this would be a very disastrous law for the manufacturing interests of the United States. In our case, the change over of designs, drawings, patterns, tools, jigs and templates would cost approximately $500,000; it would take, years to accomplish it and be a constant turmoil. The same will hold good in almost every manufacturing shop in the United States, the cost, of course, being gaged by the size of the shop.

Manufacturing, as is well known, is the life of any country. If the manufacturing is hampered and interfered with, it means a loss to the country as a whole. Are there any manufacturing plants of any size and age that are in favor of the Metric System? We do not know of any. The large manufacturing countries of the world, the United States and England, do not use the metric system. There are more shops in these countries than in the balance of the world, and their products are distributed throughout the world.

The changing of systems would mean the changing of every public and private record of measurements in the United States and would be more costly than a war, and we know what war costs.

We think that if Congress would investigate the subject from a practical point of view there would be no question but what it would not consider the change under any circumstances.

Yours truly,

THE LODGE & SHIPLEY MACHINE TOOL CO.,
Cincinnati, Ohio
J. Wallace Carrel,
Vice-President and General Manager

Pittsburgh Chamber of Commerce Committee Report

This is the report of the Pittsburgh Committee on Trade and Commerce which was unanimously approved by the Board of Directors. It opposes the adoption of the Compulsory Metric System.

Pittsburgh, Pa., Jan. 22, 1920.

TO THE BOARD OF DIRECTORS,
Chamber of Commerce of Pittsburgh.

Gentlemen:

Your Committee on Trade and Commerce has given careful attention to the question of the adoption of the metric system of weights and measures, as suggested in the report of your Committee on Suggestions and Recommendations which was referred to this Committee for consideration.

At the present time there is being conducted by an organization styling itself the "World Trade Club," with headquarters in San Francisco, an active campaign favoring immediate legislation to make compulsory the exclusive use of the metric system and thousands of letters have been pouring into Washington from all parts of the country, with the result that a bill has been prepared for presentation to Congress. It is not at all clear who and what the World Trade Club may be or from what source its evidently abundant finances are procured. It is certain, however, that the country is being flooded with a mass of literature quoting innumerable authorities on the subject. In a casual glance through one of the pamphlets we find the statement:

> "In the British Isles, however, currency not being decimal, but divided into guineas, pounds, crowns, half crowns, florins, half florins, shillings, half shillings, pence and farthings, etc., . . ."

In this statement the effort to create sentiment against the sub-divisions has led to inaccuracy, inasmuch as the guinea has long been obsolete, and the half florin and half shilling never existed. It is possible that on examination more inaccuracies would be found in the great mass of literature so lavishly distributed.

The metric system was legalized in 1866 by virtue of an Act of Congress. Thus, for over fifty years, it has stood on a legal parity with the English system and fully available to all who wished to use it. *Is it not therefore fair to say that if it cannot win on its own merits by voluntary adoption under the protection of this law, it is not entitled to win under a law of force?* The present attempt is to prohibit the use of the existing system and make the metric standard the one exclusive official system.

At this time, when as a result of the world war, production and commerce are in a chaotic condition, and when the whole world is hungry for the products of the two greatest nations whose commerce would bear the whole burden of this inopportune tampering with the fundamentals, it would be folly to make "confusion worse confounded" by attempting any such radical change.

It is, and always has been, the practice of Pittsburgh Manufacturers to quote upon inquiries as well as to execute orders based on the metric system. This is readily done by converting into our own equivalents.

Three-fourths of the world's manufactured goods and more than a large majority of the machine tools used in Latin-America are produced on the system of measurements which we use today.

As soon as it became known that the Chamber was to consider this subject, your Committee began to receive in rapid succession communications from prominent manufacturers and representative organizations, all but two of which vigorously condemned the effort to further disrupt our industrial and commercial conditions by inopportune tampering with such a vital basis of production. Among these correspondents might be mentioned the American Hardware Manufacturers' Association, the American Institute of Weights and Measures, *Iron Age*, the American Flexible Bolt Company, the American Spiral Spring and Manufacturing Company, Fawcus Machine Company, Harris Pump and Supply Company, Homestead Valve Manufacturing Company, Keystone Driller Company, Lockhart Iron and Steel Company, Locomotive Stoker Company, J. & J. B. Milholland Company, the McConway & Torley Company, Penn Bridge Company, Pittsburgh Machine Tool Company, Pittsburgh Piping and Equipment Company, H. K. Porter Company, the Simonds Manufacturing Company, Standard Underground Cable Company, James B. Sipe & Company, Union Switch and Signal Company, United Engineering and Foundry Company, Westinghouse Electric and Manufacturing Company, Westinghouse Air Brake Company, the Wilson Snyder Manufacturing Company, the Carnegie Steel Company, and the Rosedale Foundry Machine Company.

Only two firms appeared to favor the meter-liter-gram system, and one of these qualifies its opinion by stating "unless the changing over would have an effect that we do not know of." That effect, as indicated above, would be to practically eliminate from the world's markets the products of the two great commercial nations affected by increasing inefficiency and decreasing production through the changing of standards, gages, dies, tools, drawings, specifications, patterns, machinery, etc., and the enormous expense incident thereto, at a time when costs are higher, production lower, and demand greater than ever before.

Be it therefore resolved, That the Chamber of Commerce of Pittsburgh unqualifiedly condemns all efforts to effect any change in the existing system of weights and measures as impractical and inimical to the trade and general commercial interests of our country, and

Be it further resolved, That copies of this resolution be sent to the Chamber of Commerce of the United States, to our Representatives and Senators in Congress, and to the Chairman and members of the Committee on Coinage, Weights and Measures, to the American Chamber of Commerce in London and to the Hon. David Lloyd George. Also, to the Chamber of Commerce in San Francisco.

Respectfully submitted,
ROBERT GARLAND,
Chairman

Millholland Number Two Friction-Head Screw Machine

The Millholland Machine Co., Indianapolis, Ind., has lately added to its line a new No. 2 friction-head screw machine which is illustrated in Fig. 1. In general appearance this machine closely follows the lines of the other sizes of Millholland screw machines. A noticeable feature is that the headstock and bed are made of a single casting. This has a heavy web extending up to the center line of the spindle, which braces the spindle-bearing housings and aids in eliminating vibration on heavy forming cuts.

The spindle is made from a high-carbon, hammered steel forging and is bored to take bar stock up to 1 in. in diameter. The automatic chuck is so designed that it accommodates itself to minor variations in diameter of the stock. The swing over the bed is 14 in. and over the cutoff, 7 inches.

The friction head and back gear, shown in the rear view, Fig. 2, are so designed that the back gears may be engaged or disengaged by means of the large center lever shown back of the cone pulley. When the work does not require back gears, they can be disengaged and the spindle gear can be wedged in such a way as to form a very effective spindle brake where quick stopping of the spindle is an important element of the production time.

Hand longitudinal adjustment and screw feed to the cut-off give an added working range. The turret is of the standard Millholland design and has a power feed attachment. The selective-speed gear box gives three feed changes for every spindle speed. These feed changes are available while the machine is in operation.

The machine is furnished regularly equipped with an unbreakable steel pan, coolant pump, piping, countershaft and the necessary wrenches.

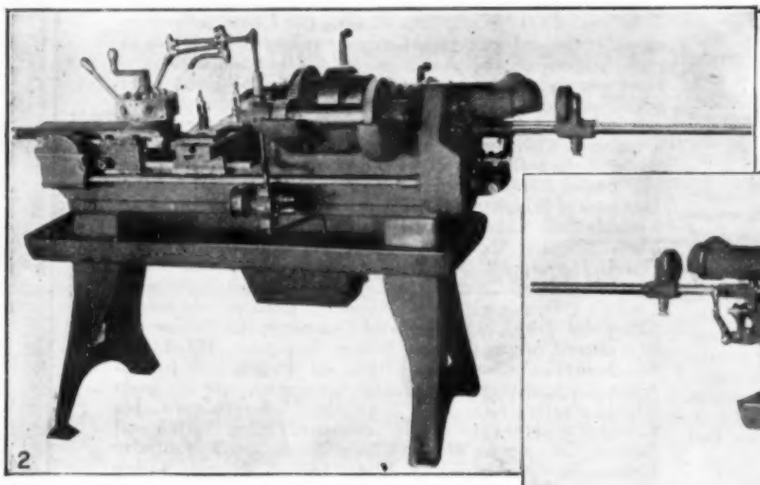


FIG. 2. REAR VIEW OF MILLHOLLAND NO. 2 SCREW MACHINE

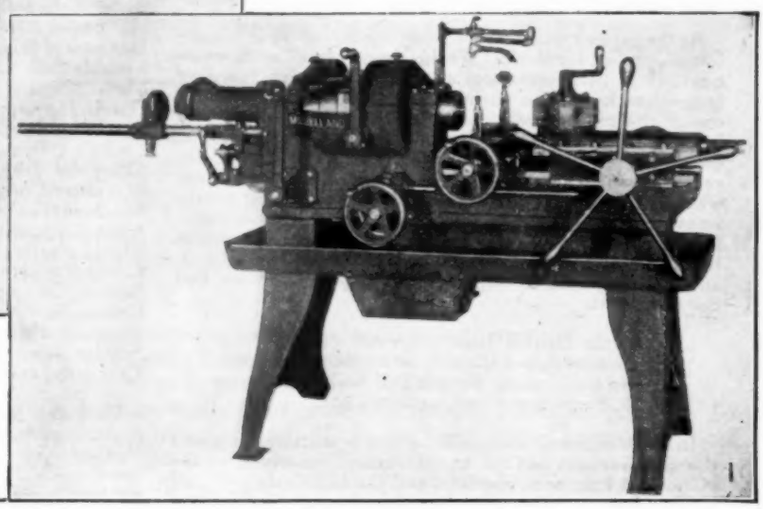


FIG. 1. THE MILLHOLLAND NO. 2 FRICTION-HEAD SCREW MACHINE

Specifications

Automatic chuck capacity, square $\frac{11}{16}$ in., hexagon $\frac{7}{8}$ in., round 1 in.; hole in spindle, $1\frac{5}{32}$ in.; holes in turret, $1\frac{1}{4}$ in.; swing over turret slide (diameter), $4\frac{3}{4}$ in.; diameter of turret across faces, $7\frac{1}{4}$ in.; length that can be turned, 7 in.; greatest distance end of spindle to turret, 15 in.; swing over bed, 14 in.; swing over cut-off, 7 in.; diameter of spindle bearings, front $2\frac{1}{4}$ x $4\frac{1}{4}$ in., rear 2 x $3\frac{1}{4}$ in.; lever movement of cut-off, $5\frac{1}{2}$ in.; friction head; feed changes, 0.005, 0.010, 0.015; width of belt for cone, $2\frac{3}{4}$ in. double; pulleys on countershaft, 10 x 14 in.; width of belt for countershaft, 3 in.; countershaft speed, steel, 230 r.p.m.; brass, 560 r.p.m.; spindle speeds (at 560), 338, 560, 932; (at 230), 138, 230, 382; floor space of machine, 60 x 26 in.; extension of wire feed rod, $47\frac{1}{4}$ in.; weight, net 1,300 lb., crated 1,500 lb., boxed for export 1,710 lb.

Definitions of Export Quotations

THE conclusions and definitions set forth here are the recommendations of a conference of the National Foreign Trade Council, Chamber of Commerce of the U. S. A., National Association of Manufacturers, American Manufacturers' Export Association, Philadelphia Commercial Museum, American Exporters' and Importers' Association, Chamber of Commerce of the State of New York and the Merchants' Association, which was held in New York City recently.

In their order these definitions of export quotations are the normal situations on which an export manufacturer or shipper may desire to quote prices. It is understood that unless a particular railroad is specified, the property will be delivered to the carrier most conveniently located to the shipper. If the buyer, for the purpose of delivery, or in order to obtain lower transportation charges, desires that the goods be delivered to a carrier further removed from the shipper and entailing a greater cost than delivery to the carrier most favorably situated, the carrier to which the buyer desires delivery of the goods should be named in the quotation. The term "cars or lighters" as used herein, is intended to include River, Lake or Coastwise ships, canal boats, barges, or other means of transportation, when so specified in the quotation.

1. When the price quoted applies only at inland shipping point and the seller merely undertakes to load the goods on or in cars or lighters furnished by the railroad company serving the industry, or most conveniently located to the industry, without other designation as to routing, the proper term is: "F.O.B. (named point)."

Under this quotation: (A) Seller must (1) place goods on or in cars or lighters; (2) secure railroad bill of lading; (3) be responsible for loss and/or damage until goods have been placed in or on cars or lighters at forwarding point, and clean bill of lading has been furnished by the railroad company. (B) Buyer must (1) be responsible for loss and/or damage incurred thereafter; (2) pay all transportation charges including taxes, if any; (3) handle all subsequent movement of the goods.

2. When the seller quotes a price including transportation charges to the port of exportation without assuming responsibility for the goods after obtaining a clean bill of lading at point of origin, the proper term is: "F.O.B. (named point) freight prepaid to (named point on the seaboard)."

Under this quotation: (A) Seller must (1) place goods on or in cars or lighters; (2) secure railroad bill of lading; (3) pay freight to named port; (4) be responsible for loss and/or damage until goods have been placed in or on cars or lighters at forwarding point, and clean bill of lading has been furnished by the railroad company. (B) Buyer must (1) be responsible for loss and/or damage incurred thereafter; (2) handle all subsequent movement of the goods; (3) unload goods from cars; (4) transport goods to vessels; (5) pay all demurrage and/or storage charges; (6) arrange for storage in warehouse or on wharf where necessary.

3. Where the seller wishes to quote a price, from which the buyer may deduct the cost of transportation to a given point on the seaboard, without the seller assuming responsibility for the goods after obtaining a clean bill of lading at point of origin, the proper term is: "F.O.B. (named point) freight allowed to (named point on the seaboard)."

Under this quotation: (A) Seller must (1) place goods on or in cars or lighters; (2) secure railroad bill of lading; (3) be responsible for loss and/or damage until goods have been placed in or on cars or lighters at forwarding point, and clean bill of lading has been furnished by the railroad company. (B) Buyer must (1) be responsible for loss and/or damage incurred thereafter; (2) pay all transportation charges (buyer is then entitled to deduct from the amount of the invoice the freight paid from primary point to named port); (3) handle all subsequent movement of the goods; (4) unload goods from cars; (5) transport goods to vessel; (6) pay all demurrage and/or storage charges; (7) arrange for storage in warehouse or on wharf where necessary.

4. The seller may desire to quote a price covering the transportation of the goods to seaboard, assuming responsibility for loss and/or damage up to that point. In this case, the proper term is: "F.O.B. cars (named point on seaboard)."

Under this quotation: (A) Seller must (1) place goods on or in cars; (2) secure railroad bill of lading; (3) pay all freight charges from forwarding point to port on seaboard; (4) be responsible for loss and/or damage until goods have arrived in or on cars at the named port. (B) Buyer must (1) be responsible for loss and/or damage incurred thereafter; (2) unload goods from cars; (3) handle all subsequent movement of the goods; (4) transport goods to vessel; (5) pay all demurrage and/or storage charges; (6) arrange for storage in warehouse or on wharf where necessary.

5. It may be that the goods, on which a price is quoted covering the transportation of the goods to the seaboard, constitute less than a carload lot. In this case, the proper term is: "F.O.B. cars (named port) L.C.L."

Under this quotation: (A) Seller must (1) deliver goods to the initial carrier; (2) secure railroad bill of lading; (3) pay all freight charges from forwarding point to port on seaboard; (4) be responsible for loss and/or damage until goods have arrived on cars at the named port. (B) Buyer must (1) be responsible for loss and/or damage incurred thereafter; (2) handle all subsequent movement of the goods; (3) accept goods from the carrier; (4) transport goods to vessel; (5) pay all storage charges; (6) arrange for storage in warehouse or on wharf where necessary.

6. Seller may quote a price which will include the expense of transportation of the goods by rail to the seaboard, including lighterage. In this case, the proper term is: "F.O.B. cars (named port) lighterage free."

Under this quotation: (A) Seller must (1) place goods on or in cars; (2) secure railroad bill of lading; (3) pay all transportation charges to, including lighterage at, the port named; (4) be responsible for loss and/or damage until goods have arrived on cars at the named port. (B) Buyer must (1) be responsible for loss and/or damage incurred thereafter; (2) handle all subsequent movement of the goods; (3) take out the insurance necessary to the safety of the goods after arrival on the cars; (4) pay the cost of hoisting goods into vessel where weight of goods is too great for ship's tackle; (5) pay all demurrage and other charges, except lighterage charges.

7. The seller may desire to quote a price covering delivery of the goods alongside overseas vessel and within reach of its loading tackle. In this case, the proper term is: "F.A.S. vessel (named port)."

Under this quotation: (A) Seller must (1) transport goods to seaboard; (2) store goods in warehouse or on wharf if necessary, unless buyer's obligation includes provision of shipping facilities; (3) place goods alongside vessel either in a lighter or on the wharf; (4) be responsible for loss and/or damage until goods have been delivered alongside the ship or on wharf. (B) Buyer must (1) be responsible for loss and/or damage thereafter, and for insurance; (2) handle all subsequent movement of the goods; (3) pay cost of hoisting goods into vessel where weight of goods is too great for ship's tackle.

8. The seller may desire to quote a price covering all expenses up to and including delivery of the goods upon the overseas vessel at a named port. In this case, the proper term is: "F.O.B. vessel (named port)."

Under this quotation: (A) Seller must (1) meet all

charges incurred in placing goods actually on board the vessel; (2) be responsible for all loss and/or damage until goods have been placed on board the vessel. (B) Buyer must (1) be responsible for loss and/or damage thereafter; (2) handle all subsequent movement of the goods.

9. The seller may be ready to go farther than the delivery of his goods upon the overseas vessel and be willing to pay transportation to a foreign point of delivery. In this case, the proper term is: "C. & F. (named foreign port)."

Under this quotation: (A) Seller must (1) make freight contract and pay transportation charges sufficient to carry goods to agreed destination; (2) deliver to buyer or his agent proper bills of lading to the agreed destination; (3) be responsible for loss and/or damage until goods have been delivered alongside the ship and clean ocean bill of lading obtained (seller is not responsible for delivery of goods at destination). (B) Buyer must (1) be responsible for loss and/or damage thereafter and must take out all necessary insurance; (2) handle all subsequent movement of the goods; (3) take delivery and pay costs of discharge, lighterage and landing at foreign port destination in accordance with bill of lading clauses; (4) pay foreign customs duties and wharfage charges, if any.

10. The seller may desire to quote a price covering the cost of the goods, the marine insurance on the goods, and all transportation charges to the foreign point of delivery. In this case, the proper term is: "C.I.F. (named foreign port)."

Under this quotation: (A) Seller must (1) make freight contract and pay freight charges sufficient to carry goods to agreed destination; (2) take out and pay for necessary marine insurance; (3) be responsible for loss and/or damage until goods have been delivered alongside the ship, and clean ocean bill of lading and insurance policy have been delivered to the buyer, or his agent. (Seller is not responsible for the delivery of goods at destination, nor for payment by the underwriters of insurance claims); (4) provide war risk insurance, where necessary, for buyer's account. (B) Buyer must (1) be responsible for loss and/or damage thereafter, and must make all claims to which he may be entitled under the insurance directly on the underwriters; (2) take delivery and pay costs of discharge, lighterage and landing at foreign port of destination in accordance with bill of lading clauses; (3) pay foreign customs duties and wharfage charges, if any.

In reaching the conclusions set forth in this statement the Conference considered the fact that there are, in more or less common use by manufacturers in different parts of the United States, numerous variations of these abbreviations, practically all of which are employed to convey meanings substantially synonymous with those here defined. For instance, there are manufacturers who quote "F. O. B. Cars," "F. O. B. Works," "F.O.B. Mill" or "F. O. B. Factory" meaning that the seller and buyer have the same responsibilities as those set forth in section 1. The Conference considered all those variations and determined to recommend the use of "F.O.B. (named point)," as "F. O. B. Detroit," "F. O. B. Pittsburgh," etc. Of the considerable number of these abbreviations which are used in the United States, the Conference felt that the form "F.O.B. (named point)" is most widely used and understood, and therefore should be adopted as the standard of practice.

The chief purpose of the Conference is to simplify and standardize American practice, and to that end it urges manufacturers and exporters to cease the use of synonymous abbreviations and quote habitually in the terms here recommended, just as far as these terms will cover the price conditions which it is desired to arrange with the buyer.

Variations of the abbreviations recommended in other sections also are in more or less common use throughout the United States. The recommendations of the Conference set forth above apply to them with the same force as to those cited under section 1.

Manufacturers and exporters are urged to bear in mind that the confusion and controversies which have arisen have sprung in part from the use of an excessive number of abbreviated forms with substantially similar meanings, as well as from the use of abbreviations in a sense different from their original meanings, or in an application not originally given them and different from the sense of application understood by foreign buyers.

In simplified and standardized practice lies the best hope of reducing confusion and avoiding controversy.

The Conference urges upon manufacturers and exporters the very great importance at all times of making their intention in whatever quotations they employ so thoroughly clear as to be impossible of misunderstanding or misinterpretation. It is much better to take the time and space at the outset to make the quotation clearly understood.

Schools Get Your Machines Now

By Val Francis

IT SEEMS to me that the various educational institutions are too slow in taking advantage of the provision of the Caldwell bill and I want to urge, as strongly as possible, that trade schools, technical institutions, local boards of education, etc., grasp this opportunity to expand their present facilities for industrial training as much as possible.

Several months ago I placed an application in the most reliable school of my district for admittance to the machine-work class. It was quite provoking to be informed that there was no vacancy for the present term and that my application would be filed for future consideration. Upon inquiry, I learned that other schools were in this same predicament. The next term came and again a notice was sent to me containing precisely the same information as the previous one.

This time, I did not accept the assurance of a future consideration, but wrote a letter to the superintendent stating that it was absolutely necessary for me to gain admittance, giving him the particular reasons. A short time later I received a post-card to go to the school for a preliminary interview. I met the superintendent, and, after a short talk, he told me that there was a vacancy in the forge-shop and heat-treatment class; that, if it was accepted, I would be admitted to the machine-work class the next term. This was a good offer, and I jumped at it, the result being that I started in the next night.

After a few nights getting acquainted with my fellow-students I found that I was quite fortunate and that most of them had much longer waiting periods. Most of these students are in the forging class under the same conditions that I am. They did not apply for the forge shop; however, now that they are in, they unanimously agree that forging and heat-treatment are good things to know about.

It seems to me that the number of school shops provided is entirely inadequate. Space to place machines does not appear to me to be the determining factor. Remember, the students are there and are all waiting for the opportunity to be admitted to the schools.

Another thing concerning students: In one of the articles published in the *American Machinist*, a paragraph stated that when the present-day student spoiled a piece of work he laughingly blamed the machine, or something else, and was quite apt to repeat the performance. As a school-shop student allow me to say in defense that none of my fellow-students, so far as I have observed, has ever made the same mistake twice. Also, each is man enough to take the blame upon himself when he does spoil work, and, further, a large percentage have been in the service and all are serious-minded young fellows.

than to be compelled in the end to go through vexatious controversy or litigation, which costs not only time and expense but customers as well. Misunderstandings can best be avoided if the seller will formulate a written statement of the general conditions under which his sales are to be made, and will see that the foreign buyer possesses these terms of sale when considering a quotation. The items which may be included in such a statement, deal with: delivery, delays, partial shipments, shipping instructions, inspection, claims, damage, and payment.

EXPLANATIONS OF ABBREVIATIONS

F.O.B.—Free on board.
F.A.S.—Free alongside ship.
C. & F.—Cost and freight.
C.I.F.—Cost, insurance and freight.
L.C.L.—Less than carload lot.

The quotation "F.O.B. (named port)" as "F.O.B. New York," "F.O.B. New Orleans," "F.O.B. San Francisco," is often used by inland producers and distributors to mean merely delivery of the goods at railway terminal at the port named. This abbreviation originated as an export quotation and had no application to inland shipments. It was used only to mean delivery of the goods upon an overseas vessel at the port named. That, in fact, is the meaning universally given to the phrase among foreigners, and is the meaning which the best practice among exporters requires it invariably to have. But because of the confusion which has arisen through the use of that form with a different meaning by inland producers and distributors, and in the interest of unmistakable clarity, the Conference most strongly urges the invariable use by American manufacturers and exporters of the form "F.O.B. Vessel (named port)." This adds only one word to the abbreviated form and has the great advantage that it cannot be misunderstood. It also avoids the difficulty which might arise among foreigners not always well versed in American geography, through confusing an inland forwarding point with a shipping port at seaboard.

The Conference calls attention to the fact that in selling "F.A.S. Vessel" manufacturers and exporters should be careful to have their agreement with buyers cover explicitly the question of responsibility for loss after goods have been delivered on the wharf or alongside the vessel and before they are actually loaded on the ship. There is no generally established practice on this point. The recommendation of the Conference in the definitions of responsibility under section 7, sets up a rule which it is hoped will lead to the establishment of a standard practice.

It is understood that the provision of lighterage covered in several of these recommendations is only within the usual free lighterage limits of the port, and that where lighterage outside such limits is required, it is for buyer's account.

In order to avoid confusion in another particular, attention is called to the care which must be exercised in all cases in making weight quotations. The net ton, the gross ton and the metric ton, all differ in weight. Similarly, there is a variation in the use of the term "hundredweight" to mean either 100 lb. or 112 lb. It is therefore not sufficient to quote a price per "ton" or per "hundredweight." Instead the Conference recommends the use of the terms "ton of 2,000 lb.," "ton of 2,240 lb.," or "ton of 2,204 lb.," etc., whichever is intended.

It is also important to note that a carload lot in the United States means the quantity of the particular commodity in question necessary to obtain the carload freight rate for transportation on American railways. This quantity varies according to the commodity and also varies in different parts of the country. Certain commodities being more bulky than others, the minimum carload for them is less than for heavier products occupying less space. The load required may range anywhere from 12,000 to 90,000 lb. Consequently, it is important, when quoting prices applicable to carload lots, so so state and to specify the minimum weight necessary to make a carload lot of the particular commodity for the particular shipment in question.

The Conference points out that in quoting "C. & F." or "C.I.F.," manufacturers and exporters moving large quantities of material by one vessel should be careful to ascertain in advance the buyer's capacity to take delivery. This because, under these terms and as a condition of making the freight rate, transportation companies may require a certain rate of discharge per day, and that rate of discharge might be in excess of the buyer's capacity to take delivery. In such event an adjustment with the transportation company would be necessary, which might affect the freight rate and consequently the price to be quoted.

The Conference also strongly urges shippers clearly to understand the provisions of their insurance protection on all foreign sales, irrespective of the general terms used thereon. In almost all cases it should be possible, when making shipments by steamer, to obtain insurance cover giving full protection from primary shipping point to designated sea port delivery, and/or foreign port delivery. As ordinary marine insurance under F. P. A. conditions, that is, free of particular average, gives no protection against deterioration and/or damage to the merchandise itself while in transit, when caused by the recognized hazards attending such risks, shippers should endeavor in all cases to obtain insurance under W. P. A. (S. P. A.) conditions, that is, with particular average (subject to particular average), when in excess of the customary franchise of 3 to 5 per cent. Under such form of insurance, underwriters will be called upon to pay claims for damages when these exceed the stipulated franchise.

The Conference points out that inasmuch as fees for consular invoices and similar items are arbitrary charges fixed by foreign governments, they are not included in the terms of C. & F. or C.I.F. quotations, and it is part of the duty of the buyer to meet them.

Finally, the Conference strongly recommends, as a most effective measure of simplification, the general practice of quoting for export, as far as possible, either "F.A.S. Vessel," "F.O.B. Vessel" or "C.I.F." Concentration on this small list, all of which terms are readily understood abroad and are difficult of misinterpretation, will, it is felt, be markedly influential in avoiding confusion and controversy.

The European Situation

BY CHARLES D. OESTERLEIN
The Oesterlein Machine Co., Cincinnati

In my opinion, the year 1920 is most apt to prove vicious because of the great temptation, on the one hand, to expand our plants and take care of the tremendous business being offered in the United States today. This is overshadowed by the contingency, on the other hand, of a possible collapse in Europe which cannot otherwise but be reflected immediately in the United States.

In order that a fair appreciation of the reasons may be had on which this belief is founded it will be necessary to refer to many experiences of my recent visit throughout ten of the European countries which extended over the latter half of last year.

It is not sufficient to argue merely that we can expect very little European business because an adverse exchange relation now exists between the United States and European countries, forcing them to pay a high premium for our dollars with which American goods can be bought. This is perhaps alright so far as it goes, but it does not give us a key to the situation responsible for this result, nor does it tell us what to expect next.

To state some of the bare facts of the overseas situation, there is a shortage of coal and food which runs nearly on to a point of total absence in at least parts of the central countries.

A hint can be taken regarding the seriousness of the coal situation in Germany from the fact that there was such an acute shortage in November that for two weeks there was not a single passenger nor freight train run in the entire country, the sole exception being food trains. Prior to this absolute discontinuance there was only one train running for every two or three trainloads of passengers and the writer was forced to stand with hundreds of others during practically the entire trip while passing through that country.

One must only note the want of coal in such countries as Holland and France and interpolate to gage the situation in the enemy countries.

Holland is so short of coal, although a neutral country, that as you pass through it you see many large meadows simply ruined because of taking up peat which seems to form the top layer of earth on which the grass grows. The amount of coal allowed per family to rich and poor alike is scarcely sufficient to heat one room for the winter.

When you come to consider France, heat in hotels was absolutely prohibited by law until after Nov 1, when after raising hotel rates to what might have been considered the limit, hotels adopted a policy of charging separately an additional amount for heat which in my case was consumed while passing through the lobby.

In view of these facts, think of what the coal situation must be in Germany and Austria, especially since the former has lost her main coal fields to France.

Surely without coal to run the railroads materials can not be transported, raw materials can not be delivered to the industries, finished materials can not be removed; in fact, without coal, almost all industries are paralyzed through lack of power.

But what seems to me to seal the fate of the central countries is this: They must now buy food and exchange goods for food at all costs. The German mark is less than a skeleton of its former self—worth one-twelfth its pre-war value, and going down. At the same time Germany must not only pay her own war costs, but as well all that is physically possible toward that of her enemies. Furthermore, the Allies' demands will have to have first consideration which will not leave a very handsome balance with which she can pay interest on her own indebtedness and buy food and certain other essentials. Upon failing to pay interest on loans from neutral sources foreclosure proceedings will be in order and the beginning of a rapid collapse may follow immediately. As an illustration of the indebtedness to neutrals, I was informed that one banking institution alone in Sweden, the Skandanavisha Credit Aktiabolaget, negotiated a loan of 150,000,000 kr. (about $37,500,000) to Germany during the war and it might be assumed that on such an item the interest must be paid in kronens which on the present basis of exchange would alone require 93 million marks annually. As an individual item this amount is rather insignificant but from this example it is plain that the countries' contracted indebtedness has multiplied many fold.

On the other hand reparations to the Allies have likewise to be made on a basis of exchange severely unfavorable to Germany. Not millions but billions upon billions are required. Much tangible property has already been attached. Steamships and railroad rolling stock are examples. From the writer's recollection it seems that nearly one-fourth of all the freight cars and passenger cars in France were formerly German as witnessed by the double eagle which has only a white cross painted through it.

It also seems as though surplus stocks of all kinds of material and goods in Germany are being turned back into cash at whatever sacrifice is necessary to close a deal. This includes machine tools. The limits to which they are going may be illustrated by the following: In spite of the fact that Germany has been at war with Italy there was a solid shipload of German machine tools forwarded last fall, two-thirds of which was unloaded in Genoa the other one-third going to Naples. One German firm has already opened offices in Milan to look after the material and another has travelers in Italy.

There is a large meadow near Delft in Holland where thousands of machine tools are unloaded in the open and exposed, and prospective buyers are asked to name their own prices for them. This simply reflects the desperate condition within the country.

As a summary of the above we may say that in Germany there is a critical shortage of food, coal and other raw materials and transportation facilities and her credit is practically that of a bankrupt. She and her allies are, however, asked to strip themselves of what remains and make up the balance of the cost of the war in labor spread over years.

This is all justly to be expected but if we are to believe that Germany's acts during the war were as told, she is not past taking up Russia's debacle and refusing to work—if before that development another form of internal eruption doesn't result in the complete collapse of the nation.

And yet, it seems that Austria is in still worse shape at the moment than Germany. Reports also indicate that Poland needs assistance. Italy has just added to her troubles through the last election in November by placing the socialists in control of the government. This by the way resulted in a demonstration in the way of a general strike tying up entire cities while the writer was there. The industrial portion of Spain was in a turmoil with a general strike in Barcelona which drove the writer out of that country rather hurriedly, having been reliably informed that over 300 people were killed in a similar strike only six months earlier.

Armies and navies are all consuming and nonproducing which accounts for the fact that during the war the nations involved consumed more than they produced. The result is an unfavorable trade balance and reflects direct in the money exchange between nations. The effect can be seen from the following illustration: At about the end of July last year the English pound sterling would only buy $4.40 of our money instead of $4.86, its normal equivalent. For the reason of this premium the English were not inclined to buy from America, feeling that the pound would come back in value, and they didn't want to suffer the consequent loss.

Along with mention of this condition came reference to America as the country whose pockets were already bulging with money. Just imagine how the feeling of that time has been intensified throughout the further falling off of the British pound to a value of only $3.70 to $3.80, whose value is yet to be depreciated by reason of the reduced purchasing power of our dollar. And yet, when the pound could still buy $4.40 the British Government made known her foreign policy, which as I remember in substance anticipated protection for home industries and encouraged co-operation between British producers in handling the country's exports. The intent seemed clearly one to get the business which competing nations had formerly gotten, and restrict invasion of her home markets.

Remember, English money had only depreciated to 80 per cent of its former value whereas German money has depreciated to 8 per cent; how much less is it possible for Germany to compete in industry? This same exchange situation places nearly the whole of Europe in a difficult situation, the seriousness of which is so important that nations are just now being called together in convention to see if means can be found to avoid a catastrophe.

Prices also come into play. To repeat figures given by an important Swiss machinery dealer who had ten days previously visited plants in Chemnitz, Germany, two marks seven pfennigs an hour is the average rate paid then to machinists. This was equivalent to less than five cents an hour. No man receiving such a sum can pay a war tax. But on the basis of this rate the cost of product is figured which surely accounts for low prices on German goods. Now wait until relief distributions are made in Germany. Food coming from America for instance must be paid for in dollars and twenty-four marks today buy one pre-war mark worth of food. If the workman is to buy this food he must receive twenty-four marks for each one he now receives plus what he requires with which to pay this war tax. Allowing that he cannot hope to live in quite such circumstances it is still plain to see how German prices will go.

I was told time and again by machinery dealers in Sweden, Denmark and Switzerland that German manufacturers think nothing of advancing prices from fifty to a hundred per cent at a time, indicating that the process was already going on rapidly last fall. Surely before long the whole German indebtedness must be saddled on to their products, and then who can afford to buy them?

In industry consider for a moment the machine-tool situation. It is hardly likely that Germany can in any event soon again carry on a large export business because of the tremendous acceleration given to this industry in neutral countries during the war. Imitations of American machines may be expected to take the place of German machines in many instances. The writer made inquiry—having seen many grades of finish on the No. 8 B. & S. cylindrical grinding machine—to find out which firm is making this imitation. The answer was that in Sweden alone eleven different firms imitate this specific machine. Four copies of a certain milling machine also presented themselves. In Switzerland, whereas before the war there were only a handful of machine-tool builders of which only one was of importance, today there are probably 150, according to the statistics published in the country. Even Spain is producing machine tools. The writer was surprised to see imitations of his own milling machines being produced in Christiania, Norway.

In conclusion such an analysis as this convinces me that a grinding, wearing process is going on and will soon reach the climax when an explosion may occur and the conflagration will surely reach us here in the event.

Therefore, before tempting extensions are made with which to take care of our immediate domestic business, a thorough consideration of this phase of the European situation is surely to be recommended.

SHOP EQUIPMENT NEWS

-Edited By-
E. L. DUNN and S. A. HAND

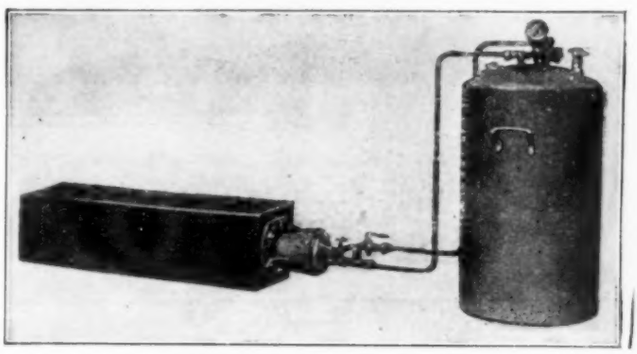
SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

"Hauck" No. 2F Heater for Drying Small Ladles

A practical and simple arrangement for heating a number of small ladles simultaneously is being manufactured by the Hauck Manufacturing Co., Brooklyn, New York. The outfit, as shown in the illustration, consists of a sheet-iron firebox and a 20-gal. steel fuel tank. The box is framed on the inside with angle iron and lined with firebrick. A Hauck furnace burner supplies the heat. The ladles are placed bottom side up over the opening in the box and the flame from the oil burner shoots up through the openings, quickly drying the linings of the ladles. The number of openings provided for the ladles varies, as the firebox is made in different lengths to suit requirements. The burner is provided with a regulating valve and is designed to consume any grade of fuel oil, crude oil, or kerosene, delivered under a pressure of 20 to 100 lb. per square inch. The tank containing the oil is charged with compressed air and has a gage and regulating valve for oil and air. The pipe connections between the firebox and the tank are made of a length to suit conditions.



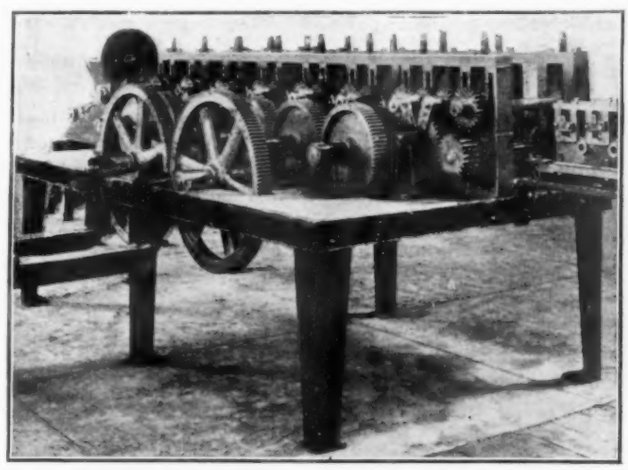
"HAUCK" HEATER NO. 2F FOR SMALL LADLES

United Molding and Tube Rolling Mill

The United Machine and Manufacturing Co., Canton, Ohio, is manufacturing a rolling mill that has a capacity to roll tube and molding sections at the rate of 60 to 300 ft. per minute, the amount varying according to the width, design of section and length of stock used.

The eight sets of spindles permit the rolling of a wide range of designs, the maximum width developed amounting to 13 in. The upper and lower spindles are power driven, providing positive roll action. The upper spindles have ample vertical adjustment adaptable to a variety of sizes and shapes, and provision is made for regrinding the roll dies when occasion requires. The spindles are of high-carbon crucible steel, hardened and ground, and running in phosphor-bronze bearings. Keyways are cut the full length of the spindles between the housings to permit the use of roll dies of variable widths.

The arrangement of the gearing distributes the application of power equally to the eight rolls, the initial drive being from a rawhide pinion attached to the motor. The feeding-in device or guide is composed of a set of horizontal tool-steel rolls hardened and ground and mounted in phosphor-bronze bearings. Different widths of stock are guided into the die rolls by the vertical grooved rolls of the feeding-in device, which are mounted on spindles carried on an adjustable cross-slide. The roll bearing blocks are mounted in housings that can be adjusted transversly on the platen without changing the vertical adjustment of the rolls.



UNITED MOLDING AND TUBE ROLLING MILL

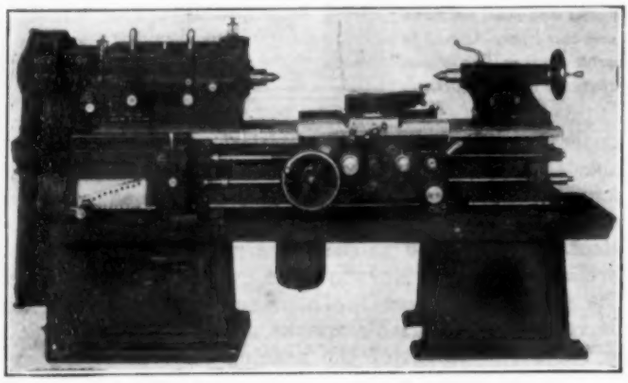
Reed-Prentice 14-Inch Geared-Head Lathe

The Reed-Prentice Co., Worcester, Mass., has placed on the market a 14-in. geared-head lathe as shown in the accompanying illustration.

The gears in the headstock are of the selective type, enabling the operator to obtain any one of the eight speeds without slowing down or stopping the machine or removing the tool from the cut. The speeds are obtained through spur gears and internal expanding

friction clutches, operated by three levers which must always be in operative position; when any one of the levers is in the neutral position the spindle will be at rest.

The spindle bearings are hardened and ground and run in bronze boxes that are scraped to a fit on the bearing surfaces. A spindle locking device is provided for use when removing the faceplate or chuck and is so arranged that it must be disengaged before the spindle clutch can be engaged. A geared pump in the



REED-PRENTICE 14-IN. GEARED-HEAD LATHE

Specifications: Spindle bearings (front, 2¾ x 5 in.; rear, 1⅞ x 3 in.); hole through spindle, 1¼ in.; taper hole, Jarno, No. 4; number of speeds, eight; number of feeds (44), 0.0045 to 0.0667 in.; threads cut, 4 to 60; taper attachment will allow turning 18 in. at one setting; will turn 26⅝ in. long with 6-ft. bed; floor space, 41¼ x 91 in.; weight (net, 2,800 lb.; boxed, 3,200 lb.).

headstock supplies all bearings, except the two main spindle bearings, with lubricant.

The apron is of the double-plate type and access may be had to all the internal mechanism without dismounting it. The lead-screw nut is so arranged that it can not be engaged in conflict with any of the feeds. Both longitudinal and cross feeds are friction operated.

The machine may be driven either by belt direct from the line shaft or by motor. The regular equipment includes a taper attachment. The steel pan shown in the illustration is only furnished as an extra.

Wilton Round Master Blocks

The Wilton Tool and Manufacturing Co., 84 Linden Park St., Boston, Mass., has added to its line a series of round master gage blocks put up in sets of different combinations.

The illustration shows set "H" comprising 16 blocks varying from 0.100 to 2.00 in., the variations being

WILTON ROUND MASTER BLOCKS

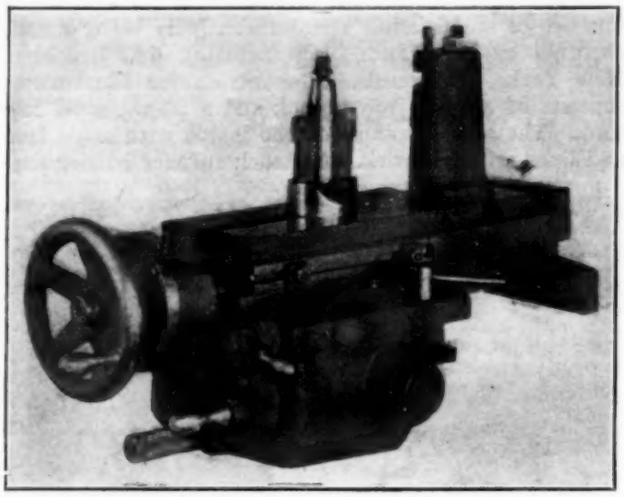
such as to give all dimensions by thousandths from 0.400 to 8 in.

Other sets give dimensions from $\frac{1}{16}$ to $1\frac{15}{16}$ in. by sixteenths; 0.10 to 2.10 by tenths, and 1 to 41 mm. by millimeters.

It is claimed that these gages are accurate to within 0.000015 in.

Millholland Power Cutoff for Screw Machines

The power cutoff slide illustrated is a feature of screw-machine construction as manufactured by the Millholland Machine Co., Indianapolis, Ind. It is intended for use when it is desired to do facing and forming while the turret tools are in operation. It has a simple and powerful friction drive. An automatic stop is provided that is tripped by either of



MILLHOLLAND POWER CUTOFF FOR SCREW MACHINES

two adjustable dogs. A hand trip lever can also be used when desired. The dial is graduated in thousandths and is provided with clips for quick reading. Eight feed changes in both directions are available through the feed-box of the machine. The lower lever is used to reverse the power feed in either direction.

Avey Automatic Drilling Machine

The Cincinnati Pulley Machinery Co., Cincinnati, Ohio, has brought out the automatic drilling machine shown in the accompanying illustration and which can be used as an automatic, semi-automatic or as a plain hand feed drilling machine.

The spindle can be advanced by hand ahead of the power feed without disengaging the latter and the clutches will pick up the power feed wherever the hand feed is dropped.

The counterweight can be regulated to accommodate different weights of tools and the shock of the returning spindle is taken up by an adjustable spring plunger.

The change from semi-automatic to full automatic operation is simply accomplished. The hand feed lever has a ratchet device whereby it can be set in any relation to the spindle or can be disengaged so as to remain idle when the automatic feed is in use.

All revolving members are mounted on annular ball bearings.

If desired, an automatic cut-off valve for the lubricating system can be furnished. With this device the lubricant will only flow while the drill is cutting.

Another device that can be attached is one that will limit the number of cycles the spindle will make before automatically stopping. This is useful in connection with automatic fixtures when operating on pieces having more than one hole of the same diameter.

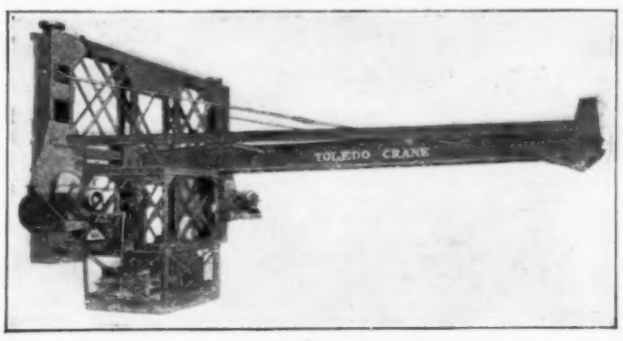
AVEY AUTOMATIC DRILLING MACHINE

Specifications: Stroke, variable from ⅜ to 5 in.; maximum number of strokes per min., 30; speeds, 4; feeds, 4; capacity, ¾ in. in cast iron, ½ in. in steel; maximum spindle speed, 3,500 r.p.m.

The machine can be furnished in the gang type having from two to six spindles.

Toledo Wall Crane

The traveling wall crane shown, is now being furnished regularly by the Toledo Bridge and Crane Co., Toledo, Ohio. It is made in two sizes with capacities of three and five tons each, both having an effective reach up to 30 ft. The crane serves as an auxiliary to the regular overhead crane, or it may be used as an independent unit. Power for the longitudinal travel is furnished by two motors connected in parallel and operated through one controller. The motor pinion engages the driving gear which is pressed on and keyed to the double-flanged and cast-steel truck wheel. A foot brake operated from the cage is provided to control the longitudinal travel and to stop the crane without the necessity of plugging the motors. The brake is of the band type, the brake wheel being mounted on the armature shaft of one of the motors. The location of the cage is optional or may be omitted entirely, as rope-operated controllers can be substituted and all operations controlled from the floor. Where rope control is employed, the foot brake is omitted and a solenoid brake substitued. The solenoid brake performs two functions. It serves to stop the motor, thus providing for a rapid reversal, and it also acts as a holding brake when the load is brought to rest through the dynamic braking action. The crane can be furnished for either direct or alternating current.



TOLEDO WALL CRANE

Garvin Cam Milling Machine

The feature that distinguishes this machine from previous designs of the Garvin Machine Co., New York City, is the change from vertical to horizontal spindle.

The machine is designed for cutting either flat or cylindrical cams. Fig. 1 shows it arranged for flat cam work. In this set-up the work is mounted on the end of the work arbor toward the spindle, with the former at the outer end of the arbor. Worm gearing drives the work arbor from the universal power feed shaft, to be seen at the front of the machine. Power is transmitted through spur gearing, giving three changes of feed when cutting flat cams.

The arm containing the work arbor pivots on the forward end, and is guided at the rear end by a substantial guide bracket mounted on the table. The arm has, in addition to its own weight, detachable weights to keep the former pin against the former, thus counteracting the stress of the cutter. These weights can be added to

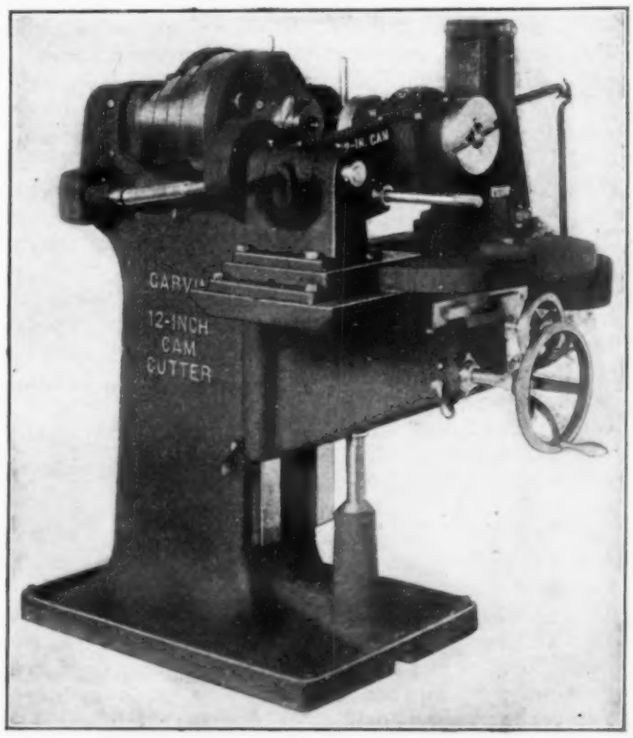


FIG. 1. GARVIN CAM MILLING MACHINE SET UP FOR FLAT CAMS

FIG. 2. GARVIN CAM MILLING MACHINE SET UP FOR CYLINDRICAL CAMS

either end of the arm, and are arranged to release the pressure on the former when cutting steep angle cams.

Fig. 2 shows the machine arranged for cutting cylindrical cams. In changing from the flat to the cylindrical cam fixture, the entire slide shown bolted to the saddle of the machine can be taken off and laid aside. The universal power feed shaft readily detaches for this purpose and attaches to the cylindrical cam fixture.

In operation the feed rotates the work arbor, the work being mounted on the far side of the fixture and the former on the other end of the work arbor. The former pin, shown at the front of the machine, is kept against the former by weights.

The movement of the cylindrical cam fixture is very sensitive, as it works on large balls in a V-shaped, tool steel track. The feed of both attachments can be disconnected by a clutch, permitting hand-feed control by a crank attached to the squared end of the worm shaft. This will be found handy in setting up for cams that are cored, also for helping over steep angles.

The spindle of the machine is of Garvin standard milling machine construction. All gearing is protected by housing. There are two changes of feed provided on the machine for use when cutting cylindrical cams. The following are the specifications:

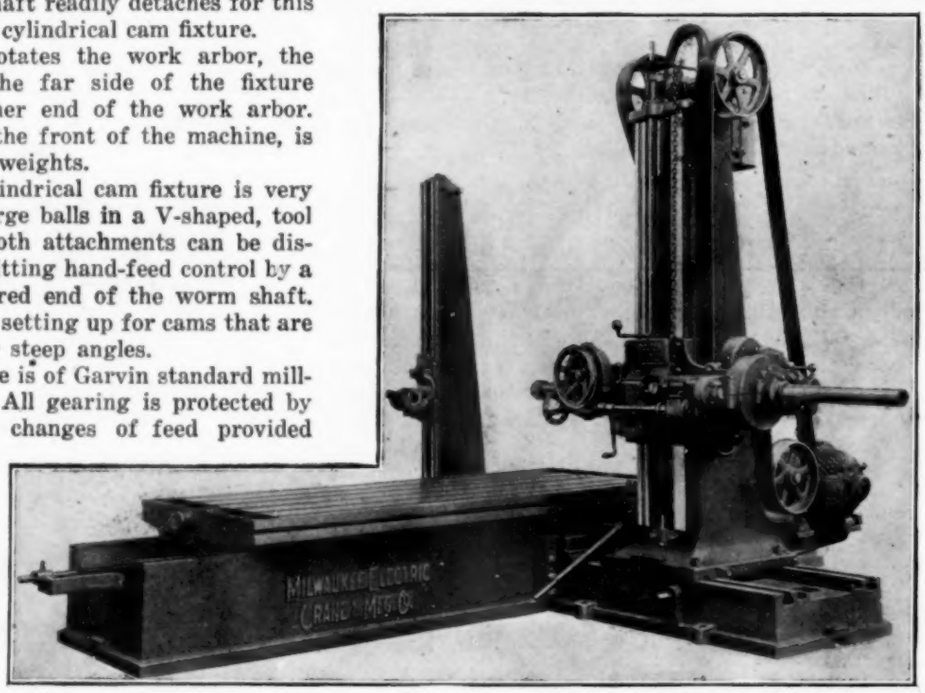
Capacity any type of cam, 1 in. to 12 in.; taper hole in spindle, No. 10 B. & S.; size of cutters used, $\frac{1}{16}$ to 2 in.; number of feed changes by four-step friction cone pulley, 8; cylinder cam throw, 9½ in.; flat cam throw, 6 in.; number of feed changes on flat fixture only, 3; number of feed changes on cylindrical fixture, 2; swing of cylindrical fixture, 12⅞ in.; speed of friction pulleys on countershaft, 120/160; space, 44 x 54 in.; domestic shipping weight (both fixtures), 2,700 lb.

"Milwaukee" Horizontal Drilling Machines

The Milwaukee Electric Crane and Manufacturing Company, Milwaukee, Wis., has just introduced a line of horizontal drilling machines designed to cover a wide range of drilling and boring and especially suited for operating—at one setting—on pieces too long or bulky for the usual type of machine. Double setting of work is not only a waste of time but a frequent cause of error when boring holes for shafts or bearings which are required to be exactly parallel, as in the case of gear housings for spur or helical gears, the teeth of which must bear evenly along the entire length of face. Originally, a homemade tool supplied with a rolling or rail table had a range of usefulness that has been sufficiently recognized to justify a modern design and a refinement of details to secure greater durability and accuracy in operation, as well as the more rapid change in speed and manipulation made possible by the use of direct-connected, variable-speed, reversible motors. The ideal drive would be obtained, if it were possible, by belting the motor to the spindle with but a single gear reduction, but as this is not feasible, the scheme adopted comes as near to it as possible in the matter of simplicity and directness.

The line includes several sizes, the smallest being No. 25-A, and the next largest being the No. 25, which is shown in the illustration.

The spindle is of high-carbon steel and accurately finished; the front bearing is 2½ in. in diameter by 7½ in. long; middle bearing, 2⅜ diameter by 6 in. long, and the driving end is 2¼ in. in diameter with two beveled keyways. The front end is fitted with a ball thrust bearing and No. 5 Morse taper hole, arranged with



MILWAUKEE HORIZONTAL DRILLING MACHINE NO. 25

Specifications: Spindle front bearing, 2½ x 7½ in.; spindle rear bearing, 2⅜ x 6 in.; spindle driving end, 2¼ in.; spindle Morse taper, 5 in.; spindle speeds—standard, 20-400; spindle feeds, six; spindle feed, 24 in.; spindle quill diameter, 4⅝ in.; spindle elevation, minimum to table, 3 in.; spindle elevation, maximum to table, 60 in.; table, width by length, 4 x 9 ft.; column movement on base, 24 in.; run of table on bed, 9 ft. 6 in.; run of column on slide, portable, 6 ft.; length of column slide, portable, 10 ft. 3 in.; variable-speed motor, 3½ hp.

special cross-key and nuts for drawing up and releasing boring bars or tools. The spindle torque is not transmitted through the tang of the drill socket or boring bar when the work is heavy.

The spindle quill is of semi-steel, 4⅜ in. in diameter, with heavy rack teeth cut for 24 in. feed, arranged to cut out the drive automatically when the spindle reaches the extreme in or out run of the feed range. Danger of stripping the feed mechanism by over-running when the feed is worked near the extremes of the run is thus avoided.

The spindle is geared for standard speeds of 20 to 400 r.p.m., which may be increased or reduced when special service is to be met. With a four to one motor speed range and sixteen-point controller, thirty-two different speeds are obtainable with a single back-gear ratio of about five to one.

All gears are of steel, wide face and carefully cut, run in oil and are supported on both sides by large bronze bearings arranged for ample and continuous lubrication. Power is transmitted through four reductions of spur gears to secure minimum boring speed and maximum torque.

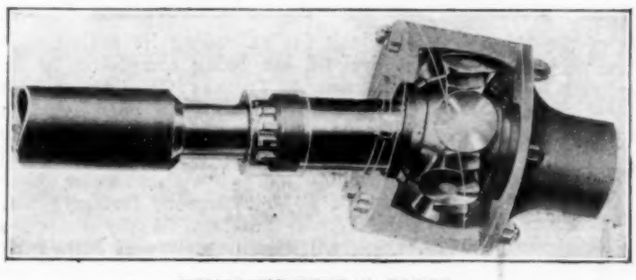
The standard spindle feeds provided for this drill are 9, 14, 20, 30, 50 and 70 thousandths per revolution. The feed is cut in or out by means of a trip lever and quick return or advance secured by means of the hand wheel on the quill-pinion shaft. Gears for change of feed are of steel and phosphor bronze, of wide face and heavy pitch and run in oil-tight case for constant lubrication. The quill drive worm wheel is of bronze, entirely covered, and the worm is of hard steel, running in oil.

Carriage elevating and lowering mechanism is operated by power or hand and the driving gear is provided with a limiting torque clutch to secure safety to the mechanism in case the carriage is clamped too hard to the column when the power drive is thrown into gear. The hand adjustment is used only to secure final setting of the carriage. A steel scale on the face of the column indicates the distance from the top of the table to the center of the spindle and a corresponding scale is carried by the outboard column.

The drill column is mounted on a side extension of the bed and is movable to or from the table to suit the size of the work and reduce the overhang of the spindle. This is an important advantage in many cases where end-milling and facing is necessary and secures more accurate spotting of the drill than is possible with a long overhang.

Ream Universal Joint

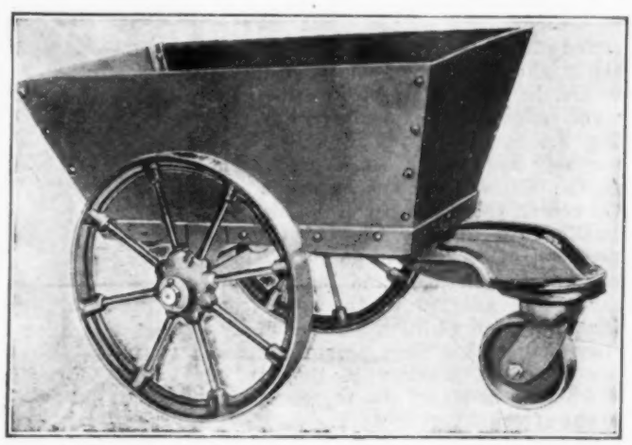
The universal joint illustrated is a product of the R.-S. Manufacturing Co., Kansas City, Mo. The design employs a flexible member having six lugs arranged to engage a like number of rollers that are mounted upon the inner portion of the case. The arrangement is intended to combine the universal action of a ball-and-socket joint with the anti-friction qualities of a roller bearing. The device is well made from drop-forgings and bar stock. The rollers and the curved surfaces of the lugs are hardened and ground. The device is balanced, and said to be free from backlash and to withstand end thrust without injury to the assembly. The mechanism is dustproof and waterproof and is packed in grease before shipment. While designed primarily for use in connection with automobiles it can be furnished for use in other commercial fields where flexible couplings are required.



REAM UNIVERSAL JOINT

Haskell Shop Truck

The shop truck illustrated is a product of the Wm. H. Haskell Manufacturing Co., Pawtucket, R. I. It was designed for general utility purposes and is suitable for carrying bolts, nuts, small castings, etc., in process of manufacture. It is of all-steel construction equipped with flat-tired wheels and is built to support heavy weights. The front wheel is supported on ball bearings and is placed in such a position that the truck steers very easily. The body of the truck is made from ⅛-in. stock, reinforced at the inside corners with heavy angle irons. The axle is made from a steel bar 1⅞ x 1½ in., the wheel bearings being turned to 1 7/16-in. diameter. The truck is made in one size only.



HASKELL SHOP TRUCK

Dimensions: Height, 26 in.; length, 44 in.; width, 26 in.; body, 21 x 31 in., by 13 in. deep; side wheels, 20 in. in diameter with 2¼-in. face; front wheel, 7 in. in diameter with 2¼-in. face; cubical contents of body, 3¾ cu.ft.; net weight, 300 lb.

Adapting a Quick-Change Drill Chuck to a Wide Range

BY GEO. C. HANNEMAN

In drilling a small part with two sizes of drills, 3/16 in. and No. 50, it was found impossible to obtain a quick-release automatic drill chuck to take both sizes. As it was not advisable to install a two-spindle drilling machine or do the job in two set-ups, the No. 50 drills were soldered into 3/16-in. shanks. This was considerable work to keep up, as a great many were used.

The final solution of the problem was to turn down the handle of a small pin-vise to 3/16-in. and use this, with the No. 50 drill inserted, the same as a 3/16-in. drill. This gave a quick change and cut out the upkeep expense.

Sparks from the World's

By E. C. Porter,

Permanent Exhibition of Construction Machinery Established in New York

The Allied Machinery Center, comprising a permanent exhibit of the products of fifteen non-competing manufacturers, was formally opened by the Allied Machinery Co. of America in New York last week. The new center occupies 30,000 sq.ft. of exhibition and office space at Center and Walker Sts. and was established as part of an educational and sales promotion plan in the field of heavy construction.

A fundamental aim of the enterprise is the education of the plant user in sound construction economics—in using the right machine and particularly, where the size of the job warrants, the right combination of equipment for doing the work with the maximum of economy and speed. As a supplement to the actual machines on exhibit at the center, there will be representatives qualified to analyze the construction problems of prospective purchasers and suggest the methods and plant equipment best adapted to the work contemplated. In addition a series of motion pictures has been prepared showing approved practice in the use of machinery in all of the representative types of construction work.

The machinery center consists of two parts. The main display of equipment is staged on the ground floor, while each of the companies forming the pool of exhibitors has an executive office on the second floor. The range of products covers concrete mixing and distributing equipment, mechanical loaders, steam shovel, trench excavator, road-roller, steam boiler, hoisting engine, saw mill, shovels, wheelbarrows, lighting devices for night work, steel forms, industrial track, locomotives, electric transfer trucks, gasoline motors, earth moving equipment including scrapers and cars.

The following firms are represented at the Machinery Center: Austin Manufacturing Co.; Austin-Western Road Machinery Co.; Barber-Greene Co.; Carbic Manufacturing Co.; C. H. & E. Manufacturing Co., Inc.; Clyde Iron Works; Cook Motor Co.; A. B. Farquhar Co., Ltd.; Hydraulic Pressed Steel Co.; Lakewood Engineering Co.; Parsons Co.; Sterling Wheelbarrow Co.; Thew Automatic Shovel Co.; Western Wheeler Scraper Co.; Wyoming Shovel Works.

At a luncheon given Jan. 27 to celebrate the opening of the Allied Machinery Center the speakers included Joshua W. Alexander, Secretary of Commerce, Senator Edge, W. L. Saunders, George Edward Smith and former Secretary of Commerce W. C. Redfield.

New Vice President for Westinghouse Electric International Company

Edward D. Kilburn, who, since March 15, 1917, has been New York district manager of the Westinghouse Electric and Manufacturing Co., was recently

EDWARD D. KILBURN

elected vice president and general manager of the Westinghouse Electric International Co.

Mr. Kilburn graduated from Cornell University, and immediately after leaving college he entered the employ of the Westinghouse Electric and Manufacturing Co., for a number of years being located at the Syracuse office of the company. Subsequently, he was transferred to the Westinghouse Machine Co. with headquarters at New Haven, Conn. In 1915 he returned to the company as manager of the power division of the New York office. A year later he was made manager of the railway and lighting divisions.

New Name for Construction Firm

The Moore-Sieg Construction Corporation, Waterloo, Iowa, has changed its name to the Sieg Construction Corporation. W. R. Sieg, formerly secretary and treasurer, is now president.

Representatives of Thirty Nations to Attend Convention of Foreign Trade Council

James A. Farrell, chairman of the National Foreign Trade Council, an organization composed of 75 of the leading American merchants and manufacturers engaged in foreign trade, announces that thirty foreign nations representing Central and South America, Canada, Australasia and the Far East, will have trade advisors at the Seventh National Foreign Trade Convention to be held at San Francisco, May 12-15, 1920, for the purpose of supplying first-hand information in regard to the markets of their respective countries.

The countries from which trade advisors are expected are as follows:

Canada.

Central America—Mexico, Panama, Salvador, Honduras, Costa Rica, Guatemala, Nicaragua.

South America—Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay, Uruguay, Argentina, Chile.

Australasia—Australia, New Zealand, Tasmania, Straits Settlement.

Far East—Dutch East Indies, Indo-China, India, Philippines, Siberia, Siam.

War Department Settles 23,214 Contracts

Contracts liquidated by the War Department to date consist of 18,354 formal agreements valued at $1,198,847,000 and 4,860 informal valued at $972,465,000. It has cost $259,783,000 to liquidate these contracts. There are 4,349 contracts still to be liquidated. Of these the value of 4,215 is known and amounts to $1,792,218,000.

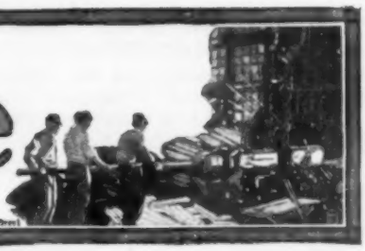
Sales reported to the Director of Sales for the week ended Jan. 16, amounted to $3,414,448 or 27 per cent of those the preceding week. The average sales amount for the five preceding weeks was $8,223,550.

Kearney & Trecker to Open a Store in Cleveland

Plans for extending its activities in Cleveland are being completed by the Kearney & Trecker Co. About Feb. 1 this firm expects to open a store, for the display and sales of machinery, at 738 Superior Ave., N. W. The Cleveland district will be under direction of C. J. Sturgeon, formerly with the W. M. Pattison Supply Co. The stock will include a line of Milwaukee milling machines, and cutters and arbors to go with them.

Industrial Forge

News Editor



Remedying the Exchange Crisis in Franco-American Trade Relations

A leading firm of American exporters has made the following agreement with its representatives in France, with a view to avoiding as far as possible the exchange crisis at present prevalent.

Goods are shipped and invoiced in dollars. The French firm does not send dollars or francs in payment, but deposits with a local bank, for the account of the American exporter, an amount in francs corresponding to the amount of the dollar invoice at the current rate of exchange. This amount is corrected every month to correspond with the fluctuations in the rate of exchange, that is, if dollars rise, an additional deposit is made to cover the difference in exchange.

New invoices are all dealt with in the same manner. An agreement has been made between the exporters and the importers for the transmission of the money deposited when the exchange rate shall have reached a level satisfactory to the importer. This agreement is for a period of two years, and, if at the end of that period, exchange has not fallen sufficiently to allow of the transmission of the money without loss to the importers, a further agreement will be negotiated between the two parties.

The money is deposited with a bank having correspondents in the United States, and the American exporter is enabled, if required, to borrow money in the United States against the deposits standing to his credit in France. The French deposit bearing interest, the American exporter incurs little or no expense in connection with his American loans, as the interest paid in France offsets that he may have to pay in the United States.

John F. Dodge Dies of Influenza in New York

John F. Dodge, one of the Dodge brothers, automobile manufacturers of Detroit, Mich., age 54, died of pneumonia and influenza at the Ritz-Carlton Hotel, New York, on Jan. 14, 1920. He was attending the Automobile Show in New York with his brother, Horace E. Dodge, when taken ill.

Mr. Dodge was born in Niles, Mich., and was the son of a machinist and ironworker. After his public school education he served as an apprentice in his father's machine shop. In 1886, he moved to Detroit to follow his trade. He was shortly afterward joined by his brother, Horace E. Dodge, and for years the brothers worked together as wage-earning machinists.

Their first business venture was in 1901, when they opened a shop of their own, employing twelve persons. They built parts for automobile concerns just starting in business.

In 1912 the brothers announced their intention of entering the automobile business on their own account. The

JOHN F. DODGE

enterprise was successful from the beginning, and under the impetus of the war it grew until to-day the Dodge interests employ approximately 18,000 persons.

One of the Dodge brothers' efforts after the United States entered the war was a $10,000,000 ordnance plant, which, despite the skepticism of military experts, produced the delicate recoil mechanism of the French 155 millimeter guns. Machinery for this plant was built in Dodge factories and within a year after its construction was started it was shipping twenty of the mechanisms daily to the proving grounds.

Opens an Office in Philadelphia

The Latrobe Electric Steel Co. announces the opening of an office in the Finance Building, Philadelphia, Pa., under the direction of Edwin M. Ong.

Trade Currents From New York, Cleveland and Chicago

New York Letter

There has been little change in the machine-tool situation here during the past week.

Prices are stable after the increases posted at last writing, but consistent rumors that more increases are on the way are going the rounds.

Orders still continue small with volume steady, and a tendency upward is noted in the weekly sales. It is expected that small orders of the one-two-three variety will prevail until March first at least.

Local agents for wood-working machinery have been advised by their principals in some cases not to commit themselves as to deliveries. Factory conditions that tend to slow up production are held responsible. One concern that distributes through one of the larger local companies has written that on one type of machine alone they are more than one hundred orders behind, with no relief in sight.

Things are running smoothly in the used-machine-tool field, with milling and planing machines leading the demand.

Evident in the used-tool houses are large quantities of line-drive equipment. This reflects the tendency of machinery users to adopt direct motor drive wherever possible.

There is a brisk demand for motors ranging from 2 hp. to 7½ hp. with few offerings.

The Savage Arms Co. has placed a list of machine tools in the second-hand market through C. A. Calleson as New York agent. Some of these machines have never been out of the original cases—a situation met with in most of the Government sales.

With sales steady, and no disturbing elements, the machine-tool men locally are well satisfied with the situation at present.

Cleveland Letter

More hesitancy on the part of general manufacturing firms in placing orders for equipment is noted during the last week by Cleveland machinery producers and distributors. It is assumed that there is uncertainty as to possible outlet for production, and for this reason manufacturers are reluctant to stock up with equipment without assurance that there will be sufficient demand for their own output. There is a suspicion in industry generally that another six months may see a significant change in business conditions.

The automotive industry hereabouts asserts that $24,000,000 worth of new business was contracted for, following the recent automobile show.

As yet, no definite plans for increased production have materialized, but when machine-tool lists are issued by the automobile manufacturers, it is expected that they will run to large proportions.

Should the heavy demand continue, there will be a shortage in machinery and tools before another three months passes, according to leaders in equipment field. Already deliveries have slowed down, due to coal, car and material shortage and also to bad weather conditions. In some instances equipment ordered has been delayed in delivery 12 to 14 weeks.

Unless there is marked improvement in weather conditions, resulting in release of coal cars in this vicinity, it will tend to prolong the machinery production shortage. The latest coal shortage has curtailed production in many industries in this section. Some manufacturers are running from day to day on their fuel supply, but the break in the weather during the past week has aided in releasing fuel, so that no plant yet has had to shut down.

The Marsh Motor Car Company will be ready soon to start manufacturing cars. On the 100-acre tract acquired by this company on Ridge Road at the Belt Line, 25 acres will be given over to workers' houses. At the beginning 900 persons will be employed.

CHICAGO LETTER

Automobiles hold the center of the stage this week, with the pleasure-car show going on at the Auditorium and the truck show at the Stock Yards Amphitheatre. This national gathering of auto builders usually brings a flood of machinery inquiries. At the present time dealers are noticing but little increased business from this source, due, probably, to the fact that auto manufacturers, truck manufacturers and tractor builders everywhere have been heavy buyers for some months. Millions of dollars worth of machine tools are on back order for delivery to this class of consumer.

Railroad business is still non-existent. Various opinions are still being aired as to when the inevitable buying will begin. It is understood that at least one of the great trans-continental lines will not be ready to take up the matter of shop equipment until its program of maintenance of way and rolling stock is well under way, which means late in the fall of 1920. It is noted that builders of railroad cars and track appliances are making some inquiries, but few bona fide purchases have been made in this line.

Chicago dealers are finding all they can do in handling current business, with no time left to worry about when non-buying interests are going to enter the field. Heavy tools remain in great demand with special emphasis being placed on large planing mills, boring mills and lathes. These are being taken by forging works to an especially heavy degree. Builders of automatic combustion plants and refrigeration machinery are all busy, and are persistent buyers of machine tools of all types.

The large number of garages with repair shops in connection which have been erected in Chicago in the last few months have been a factor in increasing call for drill presses and small lathes. Many machine shops and factory additions which were initiated last spring, are also nearing completion, and orders covering equipment for them are much in evidence. Local dealers have been physically handicapped the last few days by the epidemic of influenza. Fatalities are very low, but illness has been sufficiently prevalent to render everyone more or less short-handed. Coupled with very bad weather, this has rendered delivery of orders a mean problem.

The Monighan Machine Co., builders of drag-line excavators, are having plans drawn for the erection of an addition to its plant to cover over 50,000 sq.ft. at a cost of about $300,000. Commonwealth Edison Company announces the early building of a large power plant on the far South Side. Aside from several fairly good sized auto service stations, no other enterprises involving ultimate machinery purchases have been announced this week.

Opportunity to Supply Machine Tools to a Far Eastern Nation

The New York district office of the United States Bureau of Foreign and Domestic Commerce lists an opportunity of supplying a large amount of machine tools to a Far Eastern nation that is about to engage in aircraft construction in a large way. There are approximately twenty-six machines required in the initial order, including lathes, planing machines, boring mills, drilling and grinding machines and forge shop equipment. To interested parties who are listed on the Exporters Index, information in detail will be given, together with the name of the local representative of the principal, at room 734, New York Customs House. Refer to (FE-70).

There is also an opportunity to place equipment in Macedonia, mostly at Salonica and Kavalla. The Greek Consulate in New York can supply information relative to this.

Warner & Swasey Holds Sales Meeting

The Warner & Swasey Co. held its annual sales meeting recently at the Cleveland headquarters. About fifteen members attended, coming from points as far distant as Boston and Minneapolis. Out-of-town representatives made reports on their respective territories, and a general interchange of ideas, to acquaint them with conditions in other parts of the country, was given. The meeting was held under leadership of L. K. Berry, domestic sales director.

Porto Rican Exposition Announced

According to present plans, a fair and exposition will be held at San Juan, Porto Rico, some time in June, the main purpose of which will be to call to the attention of the inhabitants of the island such American industrial and agricultural machinery and products as will be of value in developing native agriculture and industries. The exposition is to be held under the auspices of the Porto Rico Development Company, which is incorporated under the laws of Porto Rico for the purpose of holding annual expositions for displaying American machinery and products not now produced in the island. The project has been indorsed by the Insular Government, and a commission of leading business men has arrived in Washington to seek the co-operation of the Government departments and of American manufacturers. Inquiries should be addressed to Hon. F. Cordova Davila, Resident Commissioner for Porto Rico, House Office Building, Washington, D. C.

Restoring Expired American Patents in Finland

Because of interrupted international postal service during the war, several foreign patentees in Finland were prevented from paying their patent fees, and consequently their patents expired. During 1919 some such patentees applied to the Finnish State Council for restoration of expired patents, and as a rule these applications were granted. In the opinion of the Minister of Commerce and Industry, such procedure is preferable to a general prolongation of the time for paying the patent fees. In reply to a letter from the office of the Minister of Commerce and Industry the minister says:

"I would suggest that all American citizens who own patents in Finland and whose patents have expired should apply in each individual case to the State Council to have their expired patents restored."

Conditions at the Krupp Plant in Germany

The following information has been given by a visitor to the Krupp plant at Essen, early in December:

The plant is making no war munitions now. The skilled workmen formerly occupied in the manufacture of arms and ammunitions are being trained to turn out high-grade industrial machinery, such as auto gears, motors, high-speed gears, milk separators, railroad locomotive cars, etc. One of the foremen told the visitor that the Krupp factory plans to attain an output of at least one locomotive and perhaps ten cars a day within six months from date.

The former gun shop has been converted into a machine shop; the fuse

(*Continued on page* 322*b*)

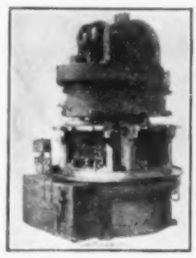
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Milling Machine, Continuous Circular
Ingersoll Milling Machine Co., Rockford, Ill.
"American Machinist," Nov. 27-Dec. 4, 1919

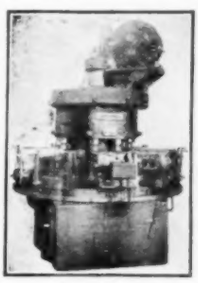
Illustration shows machine of the single-station type, requiring but one operator who loads and unloads the fixtures as each one is brought to the proper station. While this is being done the work in other fixtures is passing beneath the cutters uninterruptedly. Machines of this type have been built with tables from 30 in. to 84 in. in diameter, according to the work they were designed for. No limit has been fixed either for the size of the table or the height of the spindle above the table. Diameter of table, 30 to 84 in.; spindles, two; adjustment of spindles, 6 in.; revolutions of table, one in 4⅘ min.; fixtures, three; power required (motor belt), 10 hp.; weight, 9000 lb.; floor space, 24 sq.ft.

Milling Machine, Continuous Circular
Ingersoll Milling Machine Co., Rockford, Ill.
"American Machinist," Nov. 27-Dec. 4, 1919



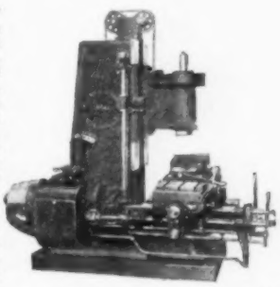
A machine built for larger work is shown here. In this machine the table revolves about a center column which also supports the head carrying the spindles. Two cutters are used for roughing, as a single cutter large enough to cover the work would impose too great a strain on its spindle. This machine can be built either with a single station or with multiple stations as the character of the work and the requirements of the user may indicate. Diameter of table, 60 in.; spindles, three; distance between table spindles, maximum 24 in., minimum 18 in.; spindle adjustments, 6 in.; revolutions of table, one in 12 min.; fixtures, five; power required, 15 hp.; weight, 24,000 lb.; floor space, 45 sq.ft.

Milling Machine, Continuous Circular
Ingersoll Milling Machine Co., Rockford, Ill.
"American Machinist," Nov. 27-Dec. 4, 1919



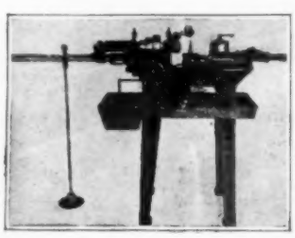
This machine is a three-station machine and is provided with six spindles, three for the roughing and three for the finishing cutters. As illustrated the table is equipped with nine fixtures and the service of three operators is required to load and unload them. The table makes one revolution in 13⅓ min., giving the machine a productive capacity of 120 pieces per hour. Diameter of table, 70 in.; spindles, six; distance between table and spindles, maximum 18 in., minimum 12 in.; spindle adjustment, 6 in.; revolutions of table, one in 13⅓ min.; fixtures, nine; power required, 15 hp.; weight, 24,000 lb.; floor space, 45 sq.ft.

Milling Machine, Vertical No. 44
W. K. Stamets, Pittsburgh, Penn.
"American Machinist," Nov. 27-Dec. 4, 1919



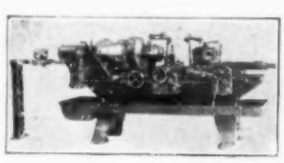
Spindle to column, 15 in.; surface of table, 14½ x 48 in.; length, 56 in.; longitudinal feed, 44 in.; crossfeed, 16½ in.; vertical feed, 19 in.; maximum distance, spindle to table, 24 in.; minimum distance, 0 in.; minimum head bearing on columns, 19 x 25½ in.; adjustment of spindle sleeve, 6 in.; taper hole, No. 12 B. & S.; diameter of spindle at taper, 4 in.; spindle speeds, 12; range of spindle speeds, 12 to 200 r.p.m.; changes of feed, 12; range of feeds, ⅛ to 17 in.; cone pulleys, 12, 13¾ and 15½ in.; belt, 3½ in.; T. and L. pulleys on countershaft, 16 x 3½ in.; speed of countershaft, 420 r.p.m.; power, quick adjustment of table, saddle or head, 11 ft. per minute; height of machine, 7 ft. 7 in.; length of table, 8 ft. 4 in.; distance front to rear, 8 ft. 6 in.; net weight, 7800 lb.

Screw Machine, No. 0
Foster Machine Co., Elkhart, Ind.
"American Machinist," Nov. 27-Dec. 4, 1919



The No. 0 and No. 1 machines, which are of ⅞- and 1⅛-in. bar capacity respectively, are designed for high spindle speed and sensitiveness of operation, so essential in machines of small bar capacity. They are built in the three-step-cone pulley, plain-head type only. The turret slide, which is operated by a hand lever, has an effective longitudinal movement of 3 in. for the No. 0 machine and 5 in. for the No. 1 machine. The No. 0 machine can be equipped with a compound rest, which is interchangeable with the lever-feed cutoff ordinarily furnished. Round turrets are used.

Screw Machine, No. 7
Foster Machine Co., Elkhart, Ind.
"American Machinist," Nov. 27-Dec. 4, 1919



Automatic chuck is of spring collet type; hood and spindle nose designed to present short overhang. Collet-operating mechanism differs from design heretofore used. Automatic chuck fingers equipped with rollers. For the bar-feed operating mechanism on the No. 0, No. 1 and No. 3 machines, the single supporting rod is used, but for the No. 5 and No. 7 machines the stock-support slides on two parallel bars. The continued motion of the automatic chuck lever, as it opens the collet, feeds the bar forward. This is accomplished through a system of links and levers in such a manner that the automatic chuck and the bar feed are operated intermittently. The No. 3, No. 5 and No. 7 machines have hexagon turrets.

Grinding Machine, Surface
S. Holmes & Co., Bradford, England
"American Machinist," English edition, Nov. 22, 1919

Designed for grinding molding box races. The cup wheel is 14 in. in diameter by 4 in. deep, running at 1,400 r.p.m., drive to spindle by 3½ in. belt. End thrust is taken on balls; weight of the grinding spindle, etc., supported by eight helical springs, the ball race and spring box being covered; on the grinding wheel, a sheet-iron guard is carried. Driving pulley runs loose in a sleeve and drives by two screwed studs to a collar on top and then by two keys to the spindle, with clearance between pulley and collar. Main bearing is 2½ in. in diameter by 9 in. long, formed by a loose split bush. Table measures 24 in. x 27 in.; T-slots cut from the solid; is elevated or lowered 13 in. by telescopic screw; has movement of 14 in. to or from the standard by 25 in. crosswise. Guaranteed accurate at the four corners to within 0.001 in. Total weight of machine is 30 cwt.

Gear-Generating Machine
J. Parkinson & Son, Shipley, England
"American Machinist," English edition, Nov. 22, 1919

To cut lighter gears up to 12 in. in diameter by 4 in. face and 5 diametral or ⅝ in. circular pitch. Two cutter boxes may be mounted so that two groups of gears may be cut simultaneously, machine being equally adapted for the production of single gears or for mass production. Headstock carrying the blanks is fixed to the bed, the spindle being horizontal. Work mandrel located in a fixed position; cutter slide head arranged to move to accommodate the blank diameters, movement by handwheel in front of the machine. Handwheel is also used for setting cutter to depth. Machine will cut diameters from ½ in. to 12 in., pitches of 5 d.p., ⅝ in. circular pitch or 5 module, spiral gears up to 60 deg., and a maximum width of 4 in. Maximum distance, end of spindle to outer support, 16½ in.; hole through spindle, 1¼ in. in diameter; taper, No. 12 B. & S.; mandrel, 1½ in. in diameter. Driving pulleys are 12 in. in diameter for a 3 in. belt and run at 330 r.p.m., the maximum power taken being 4 hp. Floor space, 54 in. x 72 in.; net weight, 4,300 lb.

shop to the making of all kinds of bolts and screws; and the gun-carriage shop to the making of Diesel motors.

The most important work the visitor saw, in point of magnitude, seemed to be the repair of locomotives; he also saw them making steel car tires. Boiler plate was also being made with the machines formerly used in making armor plate.

One of the Krupp superintendents stated that they were seeking to sell a great deal of extra machinery, lathes, etc., which had been installed during the emergency of war. It was also stated that during the war the area of land occupied by the plant was increased 70 per cent.

Previous to the war (in 1914) 41,263 men were employed in the works at Essen, and 39,028 were employed at places outside of the main factory, making a total of 80,291 employees. During the war a total of about 171,000 laborers and mechanics were employed. At the present time the total number is reduced to 84,876, of which 44,758 are employed in the factories.

The workmen at the plant are reported as being fairly well satisfied with wages and living conditions and they now work eight hours a day instead of twelve, as during the war.

Year's Imports and Exports Estimated

Exports of the United States for the year 1919 exceeded the volume of imports for the year by more than $4,000,000,000, according to reports recently issued by the Department of Commerce. The excess of exports over imports by $4,017,000,000 for the year establishes a new record in the history of foreign trade.

The total of exports for the past year the Department estimated at $7,922,000,000, as compared with exports of $6,149,000,000 for the year of 1918, an increase of over $1,500,000,000. Imports for the past year totaled $3,904,000,000, it was estimated, as against imports of $3,031,000,000 for the year 1918.

American Chamber of Commerce Formed in Bolivia

American business men of La Paz, Bolivia, met in the American consulate on Dec. 12 and organized a body to be known as the "American Chamber of Commerce of Bolivia." All American firms established in Bolivia will be eligible for membership. The American Minister of Bolivia, Hon. Samuel A. Maginnis, was elected honorary president, and Consul Ross Hazeltine was made honorary vice president. The following active officers were elected: President, George A. Easley; vice president, L. M. Salisbury; secretary-treasurer, Victor L. Tyree.

Fourteen American companies established in Bolivia form the membership to date.

Are You a Neat Mechanic?

BY THE NEWS EDITOR

Few mechanics realize what a tremendous influence appearances have to help or hinder them in their progress. They do not seem to appreciate the value of always being well groomed, of being smartly and becomingly dressed in looking around for a position.

One's personal appearance, his dress, his manner, how he carries himself, what he says and how he acts, mean as

much to him as the display and advertising of goods in a merchant's window.

A mechanic's appearance is taken as an indication of his ability to turn out a neat and satisfactory job. He is advertising himself as a success or a failure. It is admitted that clothes do not make the mechanic, but the habits of the man are quite often judged by the neatness of his clothing.

The mechanic who is neat about his person usually has his tools easily located, and systematically arranged.

He takes pride in keeping his machine neat and clean, and his tools in good shape and ready for immediate use. He seldom borrows tools, and usually dislikes to loan them. His clothing may be cheap and may be badly worn, but when it is clean and mended and has a tidy appearance, no one thinks less of him for not dressing better.

The efficient foreman of any shop will insist on having the floors clean, free from oil, waste and rubbish. He will have all castings systematically piled so they may be easily identified. He has very little use for the sloppy mechanic.

Cleveland Schools Buy Government Machine Tools

Cleveland school authorities have availed themselves of the Government's offer of machine tools to educational institutions at 15 per cent of the original cost to the Government.

Machinery costing approximately $8,500 was purchased as an opening order, and it is reported that other orders will be placed shortly.

The pupils of the East Tech. and West Tech. High Schools will benefit first. Milling machines, an engine lathe, pneumatic hammer, portable electric grinding machine, and an Acme screw machine comprise the initial purchase.

Warner & Swasey Investigate Export Field

C. J. Stilwell, foreign sales manager of Warner & Swasey, has left for Europe where he will spend three months studying trade conditions.

Most of his time will be spent in England and France with attention to Continental Europe as circumstances permit.

Short Trade Notes

The Toledo Machine Tool Co., Toledo, Ohio, has closed a building contract with the Sheldon Engineering Co., for the construction of a $60,000 power plant.

* * *

The Cadillac Motor Car Co., Detroit, Mich., is building a $300,000 assembly plant at Milwaukee, Wis.

Business Items

The Modern Tool Co., Erie, Pa., has opened a new branch office in The Bourse, Philadelphia, Pa., in charge of B. Roen, formerly of the Chicago office. Mr. Roen is succeeded in the Chicago office by Carl Johnson.

The Bagley & Sewall Co. has purchased the plant equipment of the C. A. Harmon & Son Machine Co., 275 State St., Watertown, N. Y., and will transfer the machinery and plant equipment to its main plant at Pearl and East Moulton Sts., Watertown, N. Y.

The Duff Manufacturing Co., Pittsburgh, Pa., has announced the opening of a branch sales office in the Book Building, Detroit, Mich., in charge of Frank J. Hunt. This new office will handle the output of the forge department of the Duff Manufacturing Co.

The Black & Decker Manufacturing Co., Baltimore, Md., exhibited at the Chicago Automobile Show its electric air compressors, portable electric drills and electric valve grinding machines. The company had its headquarters at the Congress Hotel and was represented by fifteen members of the firm.

(*Continued on Page 322d*)

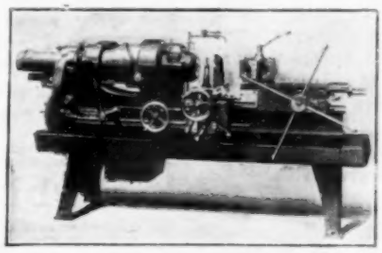
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Turret Lathe, No. 6

The Warner & Swasey Co., Cleveland, Ohio

"American Machinist," Nov. 27-Dec. 4, 1919



Specifications: Swing: over bed, 20¾ in.; over carriage guides, 18¾ in.; over cross-slide, 9¼ in. Capacity of automatic chuck: round, 2¼ in.; square, 1 7/16 in.; hexagon, 1 1/16 in. Spindle hole, 2 3/16 in.; thread on nose, 6¾ in. diameter; pitch, five per inch. Cone: three steps; width of belt, 3½ in. Turret: tool holes, 1¾ in.; center of holes to top of slide, 3¾ in.; width across flats, 10½ in.; power feeds, four. Heavy-duty carriage: cross-travel, 10 in.; longitudinal travel, 14 in.; power feeds, six. Standard carriage: cross-travel, 9 in.; longitudinal travel, 10 in. Countershaft (double-friction): pulleys, 14 in. in diameter; belt, 4 in.; speeds for brass, 320 r.p.m.; speeds for steel, 160 r.p.m. Horsepower required, three. Floor space, 32 x 104 in. Weight, 3,600 lb.

Cutter, Inserted-Tooth.

New Britain Tool and Manufacturing Co., New Britain, Conn.

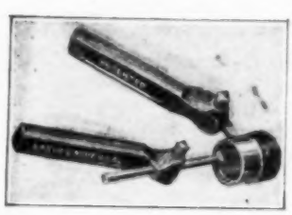
"American Machinist," Nov. 27-Dec. 4, 1919

The body of the cutter is made of mild steel and the blades of high-speed steel. The pins that hold the blades in place are parallel and are a light drive fit in their respective holes, which latter are drilled at an angle of 6 deg. from parallelism with the center line of the cutter. Width of cutters can be restored after wear by loosening each alternate pin, driving the corresponding blade to one side, and again tightening the pin. The cutter is then ground to its original width, the offset blades furnishing the cutting edges on one side and the alternate blades on the other.

Toolholder, Universal.

Universal Tool and Manufacturing Co., Inc., 680 South 11th St., Newark, N. J.

"American Machinist," Nov. 27-Dec. 4, 1919

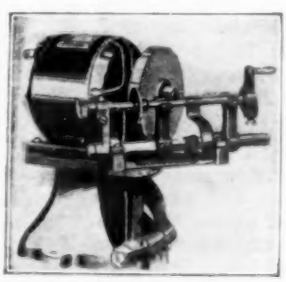


The toolholder is called universal, because it is convertible to right-hand turning, left-hand turning, or boring, and is suitable for tools made from either square or round stock. The illustration shows two views of the same tool with the setscrew in different positions, a threaded hole being at both sides for that purpose. The hole for the toolbit is broached square besides being reamed and will hold square or round stock equally well.

Grinding Machine, Valve.

D. F. Dunham, 830 West 37th St., Los Angeles, Cal.

"American Machinist," Nov. 27-Dec. 4, 1919

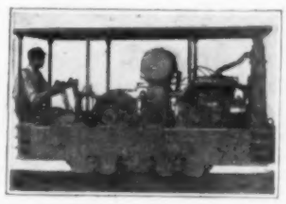


A bench grinding machine designed primarily for valve facing, but with an extra hub and wheel, permitting the grinding of small tools, etc.; has ⅓ hp. Westinghouse motor of standard construction. It may be quickly made ready for use by connection to any lamp socket; drop cord and plug is included in the equipment. A single snap-switch is used to set motor in motion; machine is always set-up and ready for service; possible to grind valves whose centers have been mutilated or which have no center. Adjustment features adapt the machine for use with valves of various sizes and shapes. While grinding, the valve is moved back and forth across the face of the wheel and at the same time rotated by the hand crank.

Locomotive, Industrial

Burton Engineering and Machinery Co., Cincinnati, Ohio.

"American Machinist," Nov. 27-Dec. 4, 1919



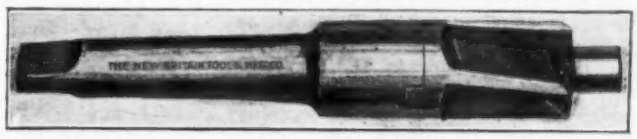
Designed to operate on either gasoline or kerosene and is built in sizes from 3½ tons to 25 tons. Power is transmitted direct through a spur friction acting on the face of the flywheel. Spur friction wheel is 22 in. in diameter slidably mounted on a large shaft supported by Hyatt heavy-duty bearings. Friction wheel may be shifted across the face of the flywheel by a hand lever, obtaining the full range of speed forward or back. Steel roller chains running on cast-steel cut sprockets are used throughout. Motor is Herschell-Spillman four cylinders, cast enblock. Engine equipment includes Bosch high-tension magneto, Zenith automatic carbureter, Pierce mechanically driven governor, and radiator having a cast-iron shell, honeycombed core and spring hangers.

Counterbore, with Renewable Cutter

The New Britain Tool and Manufacturing Co., New Britain, Conn.

"American Machinist," Nov. 27-Dec. 4, 1919

The shank is made of carbon steel and drives the cutter by means of a keyway across its end, into which fits a substantial key made integral with the cutter. Cutter is held in position by the removable pilot which passes through it and is secured to the shank by a setscrew. A shallow tapered groove in the shank of



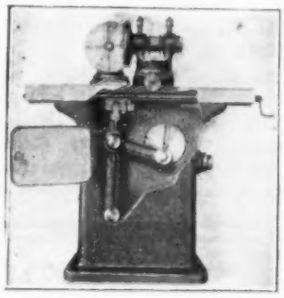
the pilot takes the point of the setscrew and, because of its taper, tends to draw the cutter back against the shank, holding the parts tightly together.

Cutter is made with long lips to provide for repeated grindings of the cutting edge. Various sizes of pilots are furnished with the tool.

Grinding Machine, Face.

Cleveland Machine Tool Co., Cleveland, Ohio.

"American Machinist," Nov. 27-Dec. 4, 1919

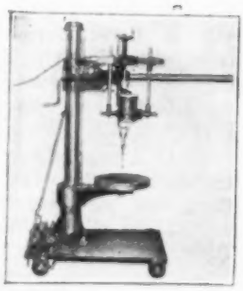


Specifications: Capacity diameter, 12 in.; thickness, 6 to 10 in.; table, 42 x 9¾ in.; stroke, 0 to 6 in.; feed changes, six; drive pulley, 3 x 2 in.; lateral adjustment of saddle, 2 in.; maximum wheel diameter, 8 in.; adjustment of work-head saddle, 6 in.; taper hole in spindle, No. 11 B. & S.; working space required, 57 x 40 in.; net weight of machine, 1500 lb.; domestic shipping weight, 1880 lb.; boxed for export, 1700 lb.; net weight of countershaft, 280 lb.; boxed for export, 380 lb.

Drilling Machine, Portable Radial Multi-Angle

The Multi-Angle Drill Corp., 1 West 34th St., New York.

"American Machinist," Nov. 27-Dec. 4, 1919



Machine is intended for use in connection with any standard electric, pneumatic or hydraulic drills though these are not furnished with the machine except on special order. Regular equipment includes an adapter for connecting the feed screw to the body of any particular make of drill. Case of the machine is mounted on wheels. Rear wheels provided with steering knuckles controlled by the hauling tongue. This enables the machine to be turned and steered in very narrow places. Specifications: Base, 40 x 48 in.; total height, 6 ft. 6 in.; maximum height of drill above floor, 4 ft.; length of arm from center of column, 5 ft. 6 in.; diameter of table, 18 in.; center of table to center of column, 15½ in.; diameter of column, 4½ in.; diameter of arm, 3 in.; will drill holes up to 1 in.; weight complete, about 900 lb.

Clip, paste on 3 x 5-in. cards and file as desired

The Bound Brook Oil-less Bearing Co., Bound Brook, N. J., has completed an additional building, 100 x 180 ft., to its plant. A power plant has also been added as well as an office building measuring 100 x 40 ft., two stories high. The new building adjoins the foundry which was completed in 1917.

The Chicago Flexible Shaft Co., Chicago, Ill., has announced the opening of a branch office at 350 Broadway, New York, for the sale and distribution of its furnaces, forges and heat-treating equipment. J. W. Lazear, formerly with the Brown Instrument Co., Chicago, Ill., will have entire charge of this office.

The Edgar A. Allen & Co., Ltd., steel manufacturer, Sheffield, England, main American office at 718-722 West Lake St., Chicago, Ill., has been incorporated as an American concern with the following officers: J. C. Ward, president; G. R. Bennett, vice-president and general manager; F. C. Leiferman, secretary and treasurer.

The Doehler Die Casting Co., Brooklyn, N. Y., held its annual meeting at its main office on Jan. 5, 1920, and the following officers were re-elected: H. H. Doehler, president; H. B. Griffin, vice president; O. A. Schroeder, treasurer; O. A. Lewis, assistant secretary. The company has also added to its list of officers the following: J. Kralund, second vice president, in charge of production, and Charles Pack, secretary and chief chemist.

The Sullivan Machinery Co, Chicago, Ill., announces the following appointments by the board of directors: Arthur E. Blackwood, formerly manager at New York office, to be vice president in charge of finance and accounting; Howard T. Walsh, vice president, in charge of sales; Gilbert K. Wilson, assistant secretary, in charge of cost accounting; Nathaniel H. Blatchford, Jr., assistant treasurer; Emil A. Krevis, general auditor; Frederick W. Copeland, manager of foreign sales.

Personals

M. M. CORY resigned his position as general manager of the Giddings & Lewis Manufacturing Co., Fond du Lac, Wis., on Jan. 1, 1920.

L. S. EIFEL, formerly Chicago representative for the Republic Creosoting Co., Indianapolis, Ind., has resigned and has been succeeded by E. E. Bolte.

A. C. DANN, formerly with the International Plow Co., Hamilton, Ont., Can., has been appointed superintendent of the Oliver Plow Works, South Bend, Ind.

ALFRED SPANGENBERG resigned his position as superintendent of the ordnance department, Mead Morrison Manufacturing Co., East Boston, Mass., and is now superintendent of the Reading Valve & Fittings Co., Reading, Pa.

F. RODGER IMHOFF, New England representative of the Precision and Thread Grinder Manufacturing Co., Philadelphia, Pa., has recently been appointed field engineer. Mr. Imhoff will make his headquarters in Detroit, Mich.

J. T. MACMURRAY, former works manager of the Mead Morrison Manufacturing Co., East Boston, Mass., has resigned his position to become vice president and general manager of the Reading Valve and Fittings Co., Reading, Pa.

LOUIS R. CHADWICK, for a number of years manager of the Seattle branch of the Sullivan Machinery Co., Chicago, Ill., has been appointed manager at New York City, succeeding Arthur E. Blackwood. Mr. Chadwick will have his headquarters at 30 Church St.

S. M. WETMORE has been appointed district sales manager of the Detroit territory for the Hammond Steel Co., Inc., Syracuse, N. Y., manufacturer of tool and alloy steels and die blocks. Mr. Wetmore will have his headquarters at 912-915 Kresge Building, Detroit, Mich.

H. C. SEAMAN, of the sales department of the E. W. Bliss Co., Brooklyn, has resigned, after having been with the company for 30 years. Mr. Seaman has entered the oil business under the name of the Seaman Oil and Refining Co., with headquarters at 379 Fifth Avenue.

JOSEPH E. VINCENT, JR., has been appointed Eastern sales representative of the Massillon Steel Castings Co., Massillon, Ohio. Mr. Vincent has his headquarters at 55 Liberty St., New York City, and also has a branch office at 120 Franklin St., Boston, Mass., which is in charge of C. H. Dayton.

FRANCIS H. M. RILEY, formerly associated with Vaughn & Meyer, consulting engineers, of Milwaukee, Wis., announces his appointment as Wisconsin representative for the Vulcan Soot Cleaner Co., Du Bois, Pa., the Vulcan Fuel Economy Co., Chicago, Ill., and the Green Engineering Co., East Chicago, Ind.

CHARLES OSTERLEIN, vice-president and general manager of the Osterlein Machine Tool Co., Cincinnati, Ohio, has just returned from a six months' tour of Europe, during which time he made a close study of industrial conditions. He visited Denmark, Italy, Norway, England, France, Spain, Portugal, Sweden, Holland and Belgium.

CAPTAIN JOHNSON MORGAN, formerly purchasing agent of the Midvale Steel and Ordnance Co., Eddystone Rifle Plant, Eddystone, Pa., has joined the sales engineering staff of the Winchester Repeating Arms Co., New Haven, Conn. Captain Morgan served for the past two years in the Ordnance Department, and during the last six months of the war was in charge of the small-arms branch, small-arms and machine-gun section, procurement division.

C. N. KELL has been appointed assistant to the general manager of the forge department of the Duff Manufacturing Co., Pittsburgh, Pa. Mr. Kell was formerly mechanical engineer with the Mandel Corporation, Chicago, Ill., and later assistant superintendent of the Denny Tractor Co., Cedar Rapids, Ia. He is a graduate from the mechanical engineering department of the University of Illinois.

Obituary

DR. RICHARD C. MCLAURIN, president of the Massachusetts Institute of Technology, died at his home in Boston, Jan. 15, 1920, of pneumonia. He was elected president of the Institute in 1908. Dr. McLaurin was born in Lindean, Scotland, June 5, 1870, and his early boyhood was spent in New Zealand where he was educated in the Auckland schools. He then went to Cambridge, and took the degrees of B. A. and M. A., afterward receiving the degree of LL.D. from Cambridge and Harvard, and other universities.

Catalogs Wanted

The J. T. Tractor Co., 1515 Fairfield Ave., Cleveland, Ohio, has installed a catalog filing system and would be pleased to receive trade catalogs on machine tools, equipment and accessories.

Forthcoming Meetings

The American Institute of Mining and Metallurgical Engineers will hold its annual meeting in New York City, Feb. 16 to 19 inclusive.

The First Annual Convention of the A. S. M. I. and the Mechanical Inspection Equipment Exhibition will be held at the Hotel Astor, New York, Feb. 2 to 6 inclusive.

Boston Branch, National Metal Trades Association. Monthly meeting on first Wednesday of each month, alternating with the Employers' Association of eastern Massachusetts. George D. Berry, secretary, room 50-51, 166 Devonshire St., Boston, Mass.

Engineers' Club of Philadelphia. Regular meeting the third Tuesday of the month. Lewis H. Kenney is the chairman of committee on papers.

Electric Hoist Manufacturers' Association. Monthly meeting at the offices of the Yale & Towne Manufacturing Co., 9 East 40th St., New York City. Secretary W. C. Briggs, Shepard Electric Crane and Hoist Co.

Engineers Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Pa.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Penn., Howard Evans, secretary, Pier 45, North Philadelphia, Pa.

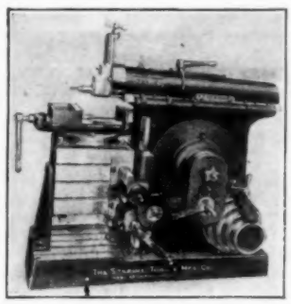
Rochester Society of Technical Draftsmen. Monthly meeting last Thursday. O. L. Angevine, Jr., secretary, 547 Arnett Boulevard, Rochester, N. Y.

The Second Annual Aëronautical Exposition of the Manufacturers Aircraft Association, Inc., will be held at the Seventy-first Regiment Armory, 34th St. and Park Ave., New York, on Mar. 6-13, 1920. S. S. Bradley, 401 Fifth Ave., New York City, is the general manager.

Condensed-Clipping Index of Equipment

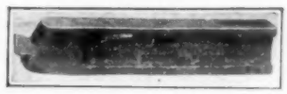
Patented Aug. 20, 1918

Shaping Machine, Heavy-Duty Crank
Streine Tool and Manufacturing Co., New Bremen, Ohio
"American Machinist," Nov. 27-Dec. 4, 1919



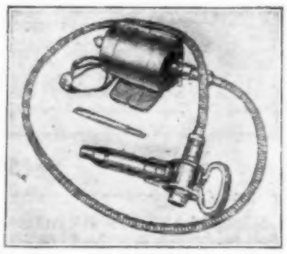
Specifications: Length of stroke, 17 in.; crossfeed table, 24 in.; vertical feed of table, 15 in.; greatest distance, table to ram, 16 in.; size of tool, ⅝ x 1¼ in.; feed of tool, 7 in.; ram bearings in column, 10 x 34 in.; length of ram, 41 in.; bull gear bearing, 10 in. diameter; top of table, 17 x 14 in.; depth of table, 15 in.; key-seating capacity, 3 in.; vise jaws, 12 x 2¼ in.; opening of vise, 12½ in.; cone changes, four; machine belt, 2½ in.; speeds of countershaft, 250 r.p.m.; size of countershaft pulleys, 12 x 4 in.; speeds to ram, eight; strokes per minute, 6 to 120; weight, approximately 3,200 lb.; floor space, 41 x 82 in.; total height, 61 inches.

Toolholder, Lovejoy Special
Lovejoy Tool Co., Inc., Springfield, Vt.
"Americar Machinist," Dec. 11, 1919



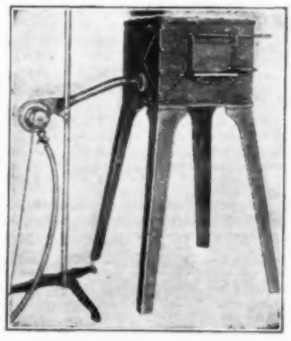
Shank size approximately 1¼ x 1⅞ in. A ¾-in., high-speed-steel cutter is placed in the holder at such an angle as to require very little grinding except on its end, and is pushed forward gradually to compensate for wear. Is recommended by the makers for right-hand turning and facing, and, by a slight change in the end of the cutter, may be converted into a serviceable planing-machine tool. Considered as a general utility tool suitable for all ordinary jobs that a solid forged tool of equal size would be used for.

Pneumatic Tool, Titan, Universal
The Machine & Tool Distributing Service, 25 West Broadway, New York City.
"American Machinist," Dec. 11, 1919



In this device the air compressor is contained within the body of the tool itself and all piping is consequently eliminated. Consists of tool point, hammer, flexible shaft, electric motor and connection. When the motor is started the piston is actuated by the crank and connecting-rod and reciprocates in the cylinder. The hammer is made in six sizes, the strength of blow ranging from a few pounds in the smallest size which is suitable for engraving and metal chasing, up to 60 lb. for the largest tool at the rate of 2,000 per minute. The tool points are included with each outfit and may be selected from a wide range of strokes. Attachments may be obtained to equip this tool for bearing and crank-case scraping, grinding, drilling and die sinking.

Furnace, Combined With Torch
The North American Manufacturing Co., 5902 Carnegie Ave., Cleveland, Ohio
"American Machinist," Dec. 11, 1919

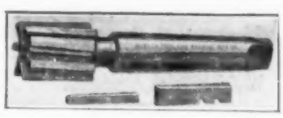


Gas-electric blow torch combined with a specially built furnace. Has a direct-acting motor and a flame adjustable from 3 to 24 in., with a maximum temperature of 2,500 deg. F. Furnace is made of cast iron, lined with special firebrick and insulated with asbestos. Can be fired from either side when using the torch and there is a 6-in. opening in the top for melting soft metals. When using for general tool-hardening, or other such work, a firebrick plug is used for the top opening. Inside dimensions are: 10 x 10 x 10 in., work door, 4½ x 6 in., with a hearth 10 in. deep.

Box, Hauserman Stacking Tote
E. F. Hauserman Co., Cleveland, Ohio
"American Machinist," Nov. 27-Dec. 4, 1919

The flange is made by folding the metal back, making a double thickness that is welded. Inside corners are reinforced by 14-gage plates welded in place. Handles are of large size, affording a secure grip; designed as a protection against pinching the hands when stacking the boxes. The bottom is reinforced by two 1-in. strap steel runners extending the full length, which allow the box to slide easily when drawn along the floor. The boxes are made in three sizes: 10 x 8 x 5 in, 12 x 20 x 5 in. and 12 x 24 x 6 in., these sizes meeting all requirements.

Cutters, Adjustable Blade Milling
Moback Tool & Machinery Manufacturing Co., 330 Atlantic Ave., Boston, Mass.
"American Machinist," Dec. 11, 1919



Employs the use of clamping wedges to hold the blades. Each wedge has three slight tapers so placed as to produce full bearing pressure on the blades. Blades are adjustable to two cutting positions. When worn to the end, blade is shifted to the second slot. Three varieties are made, including a complete line of end mills with diameters from 1⅛ to 3⅞ in., having 9, 10, 11 and 12 B. & S. taper shanks; face milling cutters, 4 in. to 15 in. in diameter, and side milling cutters from 4 in. to 16 in. in diameter, right or left, with faces 1¼ in. to 3 in. in width.

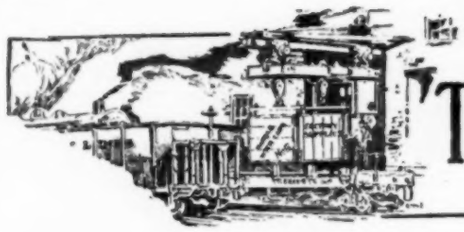
Universal Slip Joint
Fox Machine Co., Jackson Michigan
"American Machinist," Dec. 11, 1919

It is known as a slip joint owing to the fact that it can be pushed or slipped into position where it locks itself firmly, being driven by a key. It can also be taken off the shaft without having to take out a taper pin. This design provides great strength owing to the wide radius fillets taking the place of a square-cut shoulder thus making one fork as strong as the opposite fork that has no gateway. The joint is very durable, having but three working parts that are hardened and, while intended for use on multiple-spindle drilling machines, it is not limited in its application, but can be furnished for other purposes.

Truck, Industrial Trailer
The Warren & Irrgang Co., Springfield, Mass.
"American Machinist," Dec. 11, 1919

This trailer, known as Type WJ10, is 36 x 72 in. in size; has a height of 16 in., and is of all-steel construction. Chassis has four 3-in., 4-lb. channels running lengthwise, tied together with ⅝- and ¾-in. truss rods and framed with 2 x 2 x ⅛ in. angle iron. The angle-iron frame has the flange up to inclose the wood platform that is bolted to it. The two channels at either side are used as supports for the wheels; front wheels are arranged to swivel. The rear wheels are 14 x 3 in.; front wheels, 8½ x 2¾ in. This trailer weighs 525 lb. and has a capacity of 4,000 lb., but it can be furnished in any size or with any super-structure that may be desired.

Clip, paste on 3 x 5-in. cards and file as desired



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co., as per Department of Commerce Committee Schedule.

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$39.10	$36.60
Northern Basic	38.20	34.00
Southern Ohio No. 2	40.80	36.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	45.65	39.40
Southern No. 2 (Silicon 2.25 to 2.75)	43.20	41.40
BIRMINGHAM		
No. 2 Foundry	35.50	33.00
PHILADELPHIA		
Eastern Pennsylvania No. 2	42.50*	38.10
Virginia No. 2	40.00*	39.10
Basic	40.00†	34.60
Grey Forge	39.50*	34.60
CHICAGO		
No. 2 Foundry local	40.00	36.25
No. 2 Foundry, Southern	40.50	38.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	39.40	.....
Basic	36.40	34.40
Bessemer	37.40	35.40

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.47	$3.47	$4.07	$3.27–2.32	$3.97	$3.47	$4.07
Soft steel bars	3.52	3.52	3.97	3.52	4.07	3.52	3.97
Soft steel bar shapes	3.52	3.52	3.97	3.57–3.82	4.07	3.52	3.97
Soft steel bands	4.22	4.22	4.57	5.25	.....	.....	.....
Plates, ¼ to 1 in. thick	3.67	3.67	4.27	4.50	4.47	3.67	4.27

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$3.50	$3.50
Warehouse, New York	3.52	4.75
Warehouse, Cleveland	3.42	3.90
Warehouse, Chicago	3.52	4.10

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Mill Carloads, Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 28 black	$4.35–4.85	$7.00–8.00	$6.22	$6.15	$6.50
No. 26 black	4.25–4.75	6.90–7.90	6.12	6.05	6.40
Nos. 22-24 black	4.20–4.71	6.85–7.35	6.07	6.00	6.35
Nos. 18-20 black	4.15–4.65	6.80–7.30	6.02	5.95	6.30
No. 16 blue annealed	3.75–4.20	5.77	5.37	5.55	5.47
No. 14 blue annealed	3.65–4.10	5.67	5.27	5.45	5.37
No. 10 blue annealed	3.55–4.00	5.32–6.00	5.17	5.35	5.27
No. 28 galvanized	5.70–6.20	8.00–9.00	7.57	7.50	8.00
No. 26 galvanized	5.40–5.90	7.70	7.27	7.40	7.70
No. 24 galvanized	5.25–5.75	7.55	7.12	6.95	7.55

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.25	$4.90	$5.50
Flats, square and hexagons, per 100 lb. base	5.75	5.40	.....

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$21.00–26.00	$25.50
Cleveland	20.00	20.00
Chicago	16.50	16.50

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire		Cast-Iron Welding Rods	
⅛, 5/32, 3/16, ¼, 5/16, ⅜	21.00 to 30.00	⅛ by 12 in. long	14.00
No. 8, 7/32 and No. 10		5/32 by 19 in. long	12.00
⅛		¼ by 19 in. long	10.00
No. 12		⅜ by 21 in. long	10.00
7/32, No. 14 and 1/16		Special Welding Wire, Coated	
No. 18		⅛	33.00
No. 20		5/32	30.00
Domestic 20c. for 1/16, 15c. for ⅛ to 3/16		3/16	38.00

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.00	8.00	8.00
Spring steel (light)	8.00	10.00	11.00
Coppered bessemer rods	8.00	8.00	6.75
Hoop steel	4.47	5.50	4.32
Cold-rolled strip steel	8.40	8.25	8.00
Floor plates	6.30	6.00	6.27

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	50½%	24%	⅜ to 1¼	30%	23½%
½	54½%	40%			
¾ to 3	57½%	44%			

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	46½%	29%	⅜ to ½	39½%	24½%
½	51½%	39%			
¾ to 1¼	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4		23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Stock discounts in cities named are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
⅛ to 3 in. steel butt welded	40%	24%	40%	31%	57½%	44%
2½ to 6 in. steel lap welded	35%	20%	42%	27%	53½%	41%

Malleable fittings. Class B and C, banded, from New York stock sell at plus 22½%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	19.25	19.00	20.00
Tin in 5-ton lots	63.00	59.00	71.50
Lead	9.00	7.875	5.30
Spelter	9.625	9.25	7.10
ST. LOUIS			
Lead	8.37½	7.50	5.00
Spelter	9.22½	8.875	6.75

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

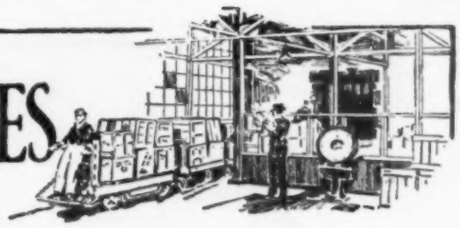
	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	29.50	28.50	29.00	31@32	31.00	36.00	32.00
Copper wire (carload lots)	29.25	28.00	28.00	29.50	32.00	27.00	28.50
Brass sheets	26.50	25.50	29.00	29.00	32.00	27.00	29.00
Brass pipe	32.00	30.50	37.00	34.00	38.00	35.00	37.00
Solder (half and half) (case lots)	39.00	35.00	41.00	40.50	44.00	38.00	39.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill. 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	23.75	26.00
New York	23.75	27.40
Cleveland	29.00	30.00
Chicago	26.00	28.50

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill..... 12.00

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.00	18.75	15.50	18.40
New York	14.00	16.00	14.50	16.50
Chicago	15.00	22.00	15.00	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	11.25	8.00
Chicago	12.00	8.50
Cleveland	11.75	10.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current	One Year Ago	Current	One Year Ago	Chicago
Copper, heavy, and crucible	17.00–17.50	16.00	18.00	17.00	17.50
Copper, heavy, and wire	16.50 17.00	15.00	17.50	16.00	17.00
Copper, light, and bottoms	15.50–16.00	12.50	16.00	13.00	15.75
Lead, heavy	6.75– 7.00	4.00	7.50	4.00	7.25
Lead, tea	6.00– 6.25	3.00	5.00	3.00	6.00
Brass, heavy	12.00 12.50	9.50	14.00	12.00	17.00
Brass, light	9.50–10.00	7.50	10.50	8.00	10.50
No. 1 yellow brass turnings	10.00–10.50	10.00	11.00	8.00	11.00
Zinc	6.00– 6.25	5.00	5.00	4.00	7.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.00c.	34.00c.@35.00c.	33½c.

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	33.00	28.00
Chicago	29.00	38.00
Cleveland	32.00	33.00

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	87.00	74.50	80.00	70.00	75.00
Commercial	50.00	42.00	20.50	21.50	15.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	List	.80	$1.00	$1.25	$1.45	.98
Hot pressed hexagon	List	.80	1.00	1.05	1.45	.78
Cold punched hexagon	List	2.50	1.00	.75	1.05	1.00
Cold punched square	List	2.50	1.00	.75	1.05	1.00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	70–5%	50–10%
Chicago	50%	50%
Cleveland	60–10%	50–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	30%	50%	35–5%
Larger and longer up to 1½ in. by 30 in.	20%	40%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... $1.50 Cleveland..... $4.50 Chicago..... $3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $3.75 Chicago..... $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	25%	40–5%	30%
Larger and longer up to 1 in. by 30 in.	15%	37½%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	List	30%	List
Chicago	10%	List	10%	List plus 20%
New York	10%	20% from list	10%	List plus 5%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅜ and smaller	40%	55% off	45%
Tinned	40%	55% off	45%

Boiler, ¾, ⅞, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York...$5.00 Cleveland...$4.00 Chicago....$4.97 Pittsburgh...$4.72

Structural, same sizes:

New York...$5.10 Cleveland...$4.10 Chicago....$5.07 Pittsburgh....$4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	33.50	36.00	35.00
Brass	32.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

COTTON WASTE—The following prices are in cents per pound:

	NEW YORK			
	Current	One Year Ago	Cleveland	Chicago
White	13.00	11.00–13.00	16.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	52.00	58.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.25	$1.75
Philadelphia	2.00	2.00	1.75
Cleveland	2.50	2.50	2.75
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40	$3.40	$3.65
Cleveland	4.25	4.625	4.25
Chicago	5.00	4.125	4.50

COKE—The following are prices per net ton at ovens, Connellsville:

	Jan. 29	Jan. 22	Jan. 15	Jan. 8
Prompt furnace	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.80	$1.49	$1.98	$1.65
5-gal. cans	2.00	1.74	2.23	1.80

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	14.50	16.00	13.00	14.50	14.50	13.00
25 and 50-lb. kegs	14.75	16.25	13.25	14.75	14.75	13.25
12½-lb. keg	15.00	16.50	13.50	15.00	15.00	13.50
5-lb. cans	....	18.00	.....	.....	16.50	15.00
1-lb. cans	....	19.00	.....	.....	17.50	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10-2½% discount.

NEW AND ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies

Machine Tools Wanted

The following concerns are in the market for machinery and machine tools.

Conn., Bridgeport—The American Chain Co., Connecticut St.—No. 30 N. Bliss arch geared press, and a No. 30 of same, No. 51 or 52 Toledo of same.

Conn., Woodbury—L. J. Allen & Son—planer and matcher.

Mass., Malden—C. H. Moss, 48 Grass St.—canning machinery.

N. J., Camden—The New York Shipbuilding Corp., Broadway and Fairview Sts.—small grinders.

N. J., Newark—The Unique Art Mfg. Co., 60 Shipman St.—single spindle high speed drill press, Leland-Gifford flour type or similar (new).

N. J., Weehawken—The Independent Lamp and Wire Co., 538 Gregory Ave.—1 No. O Brown & Sharpe automatic screw machine.

N. Y., Baldwinsville—The Morris Machine Wks.—oil burning brass furnace. L. L. Hofmann, Secy. Treas.

N. Y., New York (Borough of Bronx)—M. Kellerman, 412 East 154th St.—Cleveland full automatic screw machine, ⅜ to 1 in.

N. Y., New York (Borough of Brooklyn)—The W. H. Jackson Co., 335 Carrol St.—No. 2 Stiles punch press.

N. Y., New York (Borough of Manhattan)—The American Gas and Electric Co., 30 Church St.—large Gantry crane.

N. Y., New York (Borough of Manhattan)—M. Gorlin, 3210 3rd Ave.—dies and button making machinery.

N. Y., New York (Borough of Manhattan)—Lamberg & Co., 243 Center St.—a 15 x 18 in. brass rolling mill.

N. Y., New York (Borough of Manhattan)—The Phoenix Specialty Co., 48 Duane St.—4 power presses, equivalent to Bliss No. 20 or No. 21.

N. Y., New York (Borough of Manhattan)—The Technical Products Co., 501 5th Ave.—an Ingersoll or Bement 24 x 30 in. head end planer.

N. Y., New York (Borough of Queens)—H. A. Mallison & Co., Woolsley Ave., Long Island City, manufacturer of silk—silk weaving and preparatory machinery.

N. Y., Phillipsburg—The Amer. Horse Shoe Co.—No. 4 special stiles power punch press or one of similar capacity (new or used).

N. Y., Sherril—Hiller, Prophet & Jackson Co.—small machine tools.

N. Y., Syracuse—The Self Lock Nut and Bolt Co., 190 North State St., Chicago, Ill.—machine tool eqiupment for the manufacture of self lock nuts and bolts.

N. Y., Watertown—Smith & Erieleigh Garage Co., Gotham St.—light machinery and machine tools for garage repair work.

Pa., Ardmore—Bd. Educ.—pumps and tanks.

Pa., Easton—J. Ferla—hydraulic press (used).

Pa., Pittsburgh—C. D. Alcom, 123 Water St.—1 No. 20 or 21 Bliss inclinable press, or No. 4 or 5 Toledo of same.

Ala., Birmingham—The Ridgeway Paper Stock Co., 1619 Ave. E.—1 Foudhinier paper machine, a battery of boilers, 4 beaters, 4 condensers.

Ga., Milledgeville—I. H. Fann, c/o Fanns Garage—milling machines.

S. D., Cotton—G. Aga—20 to 26 in. x 10 to 14 ft. quick change, hollow spindle lathe.

Ill., Aurora—The Barber & Greene Co., West Park Ave.—4 or 6 spindle gang drill of capacity for 1 in. high speed steel, power feed (used).

Ill., Chicago—The F. C. Harper Screw Works Co., 29 South Clinton St.—double stroke cold bolt heading machine, ⅜ in. and up, bolt head trimmer, ⅜ in. and up; Ovey drills, No. 2½ or No. 3; 2 spindles, with 12 in. or more overhang; full automatic hopper feed thread rolling machines; screw slotting, cotter pin hole drilling machines.

Ill., Chicago—The United States Gypsum Co., 205 West Monroe St.—24 in. x 16 ft. engine lathe, hollow spindle, back geared (new).

Ill., Peoria—The Holt Mfg. Co., West Washington St.—No. 6 geared Toledo inclinable open back press, bed 22 x 30 in., bottom of slide 7¼ x 13¼ stroke, 3 in. (new).

Ill., St. Louis—Hammar Bros. White Lead Co., 225 St. Clair Ave., East St. Louis—2 electric traveling cranes, 3 ton capacity. F. V. Hammar, Pres.

Ind., Evansville—Igleheart Bros., 1st Ave.—small power metal lathe.

Ind., Richmond—The Hayes Track Appliance Co., North 3rd St.—vertical drill press as follows: travel of spindle, 14 in., center of spindle to column 14 in., bored for No. 4 Morse tap or larger, spindle to base 36 in. (new).

Mich., Detroit—The Braun Lumber Co., Davison Ave.—planing mill and woodworking machinery for the manufacture of interior finish.

Mich., Detroit—The Dordea Mfg. and Novelty Co., 275 Jefferson Ave., E.—1 small thread cutting speed lathe.

Mich., Detroit—Stearns Register Co., 111 East Fort St.—press to compare as to size with No. 166 Consolidated.

Mich., Port Huron—The Mueller Metals Co., Lapeer Ave.—screw machines.

O., Cleveland—The Cleveland Worm and Gear Co., 1667 East 40th St.—8 ft. bed milling machines.

O., Cleveland—The Glidden Varnish Co., Madison Ave. and Berea Rd.—complete plant for making paint cans.

O., Cleveland—The Sheet Metal Products Co., 16 St. Clair Ave.—open back inclinable power press, equivalent to No. 3 Niagara.

O., Greenville—The Franklin Tractor Co.—lathes, boring mills, shapers, presses, drill presses, also 750 magnetos, 750 sets of radiator cores, 1,500 rear sprockets, (steel castings), 1,500 front sprockets, (steel castings), 4,500 track rollers, (grey iron castings), 1,500 upper track roller idlers, (grey iron castings), 4,000 brackets, (grey iron castings), 750 gasoline tanks, (Armco iron or equivalent), 750 gasoline tank pedestals, (grey iron castings), 750 steering wheels, 750 spring seats or equivalent, 7,000 lin.ft. steel angle 4.4 lb., 7,000 lin.ft. steel channel 5 lb., 2,000 sheets blue annealed Armco iron or equivalent, 100 tons cold rolled rounds, 1 to 3 in. diameter, 750 complete sets transmission gears, 750 presses split steel pulleys, or 750 power take off systems complete, 750 transmission housings, (grey iron castings), 750 clutches, 60,000 steel treads for crawler type tractor, 750 radiator filler caps, 750 radiator cases, (grey iron castings), 750 motor fans and belts, 750 liquid type, air cleaners, 4,000 spark plugs, 750 complete rear systems, 750 front axles, steel castings 155,250 bearings, 750 carburetors, 750 governors.

O., Springfield—The W. Bayley Co., 126-50 West North St.—8, 10 or 12 in. crank shaper (used).

O., Toledo—The American Pipe and Tube Co., Morris St. and Broadway—10 or 12 in. pipe threading machines, or smaller size (new or used).

Wis., Fond du Lac—W. J. Nuss Lumber and Supply Co.—planing mill machinery.

Wis., Green Bay—W. M. Conway, Courthouse—compressed air rock drilling outfit.

Wis., Milwaukee—The Gas Power Engine Co., 211 North Ave.—No. 60 Heald cylinder grinder (new or used).

Wis., Milwaukee—Gender, Paeschke & Frey Co., St. Paul Ave. and 15th St.—No. 4½ Bliss geared double crank press with 2 in. stroke.

Wis., Milwaukee—The Speer Rosefelt Calendar Bank Co., 1187 Booth St.—stamping presses.

Wis., Milwaukee—Williams Bros., 481 Broadway, cabinet makers—woodworking machinery.

Ia., Newton—The Iowa Punching Wks.—punch press similar to a No. 3 Sidney, belt drive, to punch 1¾ in. washer from No. 10 sheet iron, a power shear to handle No. 10 sheet iron and a set of standard progressive washer dies from ⅜ in. to ¾ in. inside diameter (new).

Mo., Kansas City—The American Scale Co.—punch press to punch 1 in. holes in 1 in. sheet metal.

Mo., St. Louis—The Jaffy Sales Co.—hand tools.

Mo., St. Louis—The Simpson Iron Wks. Co. is building a new plant. Estimated cost, $300,000.

Mo., Springfield—The Meredith Battery Co., 151 St. Louis St.—lathe for making armatures, not to exceed 6 in. in diameter and 20 in. between centers (used).

Mo., Springfield—The Springfield Motor and Machine Co., 215 East Olive St.—16 or 18 in. lathe with taper and key seating attachment; portable crane and hoist.

Tex., Jacksonville—The S. G. Hall Machine Co.—quick change lathe, with 16 to 24 in. swing, 12 to 20 ft. bed, a 24 in. shaper and a 24 to 36 in. B. G. S. H. drill press (new or used).

Ore., Pendleton—The Golden West Creamery Co.—machinery for the manufacture of ice cream and butter, including 1 cherry churn and 1 brine freezer with attachments. Estimated cost, $10,000. D. P. Smythe, Pres.

Ore., Portland—The H. Funk Automobile Co., 260 East 6th Ave.—gear cutting machine (used).

Ore., Shady (Roseburg P. O.)—The Perkins Sand and Gravel Co.—machinery adapted to burning oil. Estimated cost, $10,000.

B. C., Vancouver—The Taylor Eng. Co., Ltd.—No. 2 Universal Cincinnati milling machine and a small shaping machine (new or used).

Ont., Huntsville—The Muskoka Wood Mfg. Co.—dry kiln equipment.

Metal Working

NEW ENGLAND STATES

Conn., Hartford—A. Goldstein is having preliminary plans prepared by F. Walz, Archt., 348 Trumbull St., for the construction of a 2 story, 101 x 119 ft. garage, on Maple Ave. Estimated cost, $100,000.

Conn., Hartford—J. P. Neilson, 40 Temple St., will soon award the contract for the construction of a 2 story, 50 x 140 ft. garage, on Maple Ave. Estimated cost, $50,000. H. H. Beckanstem, 1026 Main St., Archt.

Me., Biddeford—The Saco Lowell Shops, 77 Franklin St., Boston, Mass., manufacturer of textile machinery, has awarded the contract for the construction of a 5 story, 88 x 300 ft. factory, here. Estimated cost, $400,000.

Me., Portland—U. A. Towle, 623 Forest Ave., has awarded the contract for the construction of a 1 story, 110 x 110 ft. garage. Estimated cost, $35,000.

Mass., Fall River—Terry & Crawford, Blossom St., is having plans prepared by E. M. Corbett, Archt., 70 Bedford St., for the construction of a 1 story, 40 x 100 ft. blacksmith shop, on Corneau St. Estimated cost, $15,000.

R. I., Woonsocket—The Amercan Wringer Co., Social St., has awarded the contract for the construction of a 1 story, 40 x 65 ft. addition to its factory. Estimated cost, $12,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Locke Insulator Co., Victoria, N. Y., is having plans prepared for the construction of two, 1 and 2 story factories and 24 kilns, on Light St. and Ferry Bar, here, for the manufacture of porcelain insulators. Estimated cost, $1,000,000.

N. J., Hoboken—The White Metal Mfg. Co., 1006 Clinton St., manufacturer of tin tubing, will soon award the contract for the construction of a 6-story, 135 x 135 ft. factory and a 3 story, 20 x 80 ft. foundry. J. C. Schaeffler, 40 West 32nd St., New York City, Archt.

N. J., Trenton—The Mercer Motor Co., Whitehead Rd., will soon award the contract for the construction of a 1 story, 80 x 400 ft. shop. Estimated cost, $50,000. Day & Zimmerman, 611 Chestnut St., Philadelphia, Pa., Archts.

N. J., Trenton—The Union Electrical Porcelain Co., Hamilton and Clark Sts., plans to build a factory, on Hamilton St., to replace one recently destroyed by fire. T. A. MacKenzie, 1404 Greenwood Ave., Pres.

N. J., Wharton—The Wharton Steel Co., Wharton St., has awarded the contract for the construction of an addition to its present plant. Estimated cost, $270,000.

N. Y., Albany—The Twin Energy Motors Co., Inc., is having plans prepared by W. H. Van Guysling, archt., 1 Clinton Sq., for the construction of a 3 story factory. Estmated cost, $1,000,000.

N. Y., Albany—The United States High Speed Tool Corp., Toledo, Ohio, plans to build a 4 story plant near here. D. H. Friedman, 741 Madison Ave., Pres.

N. Y., Buffalo—The Auto Club Garage, Inc., 518 Rhode Island St., plans to build an addition to its garage. Estimated cost, $25,000.

N. Y., Buffalo—The Buffalo Porcelain and Enameling Co. plans to build a 2 story factory, at 1927 Elmwood Ave. Estimated cost, $20,000 to $25,000.

N. Y., Buffalo—The Johnson Rim and Parts Co. plans to buid a factory, at 2600 Delaware Ave. Estimated cost, $25,000.

N. Y., Buffalo—The C. Klink Packing House Co., 50 Depot St., plans to build an addition to its packing house. Estimated cost, $30,000.

N. Y., Buffalo—The Philadelphia Rubber Co., 37th and Reed Sts., Philadelphia, Pa., has awarded the contract for the construction of two 1 and 3 story factories, a power plant, office buildings and garage. Estimated cost, $1,000,000.

N. Y., Buffalo—The Rome Wire Co., Rome N. Y., manufacturer of copper wire, has purchased the J. J. Carrick Bldg., on Kensington and Clyde Aves., here and will also erect several other buildings, and equip same for its own use. H. T. Dyett, Pres.

N. Y., New York (Borough of Brooklyn)—The American Safety Razor Co., 303 Jay St., will soon award the contract for the construction of a 5 story, 75 x 140 ft. factory, a 1 story, 25 x 125 ft. factory, a 2 story, 45 x 50 ft. garage, and a 1 story, 25 x 50 ft. boiler house, on Lawrence, Johnson and Jay Sts. W. Higginson, 18 East 40th St., New York City, Archt.

N. Y., New York (Borough of Brooklyn)—F. T. Martin, 16 Court St., will build a 1 story, 100 x 150 ft. garage, on Malbone St. near Bedford Ave. Estimated cost, $40,000.

N. Y., New York (Borough of Manhattan)—The Summit Holding Corp., Inc., will build a 1 story, 100 x 125 ft. garage, on 137th St. and Lincoln Ave. Estimated cost, $25,000.

N. Y., New York (Borough of Queens)—The Queens Tool & Die Co., 136 West Ave., Long Island City, will soon award the contract for the construction of a 2 story, 40 x 50 ft. factory, on 5th and Washington Aves. Estimated cost, $40,000. W. Sposser, 211-12 12th Ave., Long Island City, Archt.

N. Y., Potsdam—H. N. Clark plans to build a 3 story, 36 x 68 ft. garage, on Water St. Estimated cost, between $20,000 and $25,000.

N. Y., Poughkeepsie—The De Laval Separator Co., Pine St., has awarded the contract for the construction of a 1 story, 150 x 150 ft. power machine building.

N. Y., Seneca Falls—Hammer & Nearpass plan to build a 3 story, 100 x 140 ft. garage, on Fall and South Walnut Sts. Estimated cost, between $75,000 and $90,000.

N. Y., Sherrill—Hiller, Prophet & Jackson Co. is building a 2 story, 50 x 100 ft. garage on Seneca St.

N. Y., Syracuse—The Self Lock Nut and Bolt Co., 190 North State St., Chicago, Ill., has purchased a 7½ acre site in East Syracuse, and plans to build a factory for the manufacture of self locks and bolts. Estimated cost, $400,000.

N. Y., Syracuse—The Syracuse Washing Machine Co., 507 East Water St., will soon award the contract for the construction of a 4 story, 200 x 250 ft. factory, on Main St. Estimated cost, $1,000,000.

N. Y., Syracuse—Tompkins Bros. & Co., 583 South Clinton St., has awarded the contract for the construction of a 72 x 288 ft. factory, with a 40 x 120 ft. ell, at 619 Oneida St., for the manufacture of knitting machinery. Estimated cost, $35,000.

N. Y., Utica—The Sherman Sales Co., Inc. 516 John St., has purchased a site on Elizabeth and Mary Sts. and plans to build a garage. Estimated cost between $75,000 and $80,000.

N. Y., Watertown—The Bagley & Sewall Co., manufacturers of paper making machinery, has purchased a site in the vicinity of their plant, on East Moulton St., and plans to build a plant for the manufacture of pulp screens.

Pa., Ardmore—Bd. Educ. will soon award the contract for the construction of a 1 story, 27 x 85 ft. garage. Estimated cost, $15,000. R. E. White, Penn Bldg., Philadelphia, Archt.

Pa., Wilkes-Barre—G. Gildersleeve, Gildersleeve St., will soon award the contract for the construction of a 2 story, 45 x 225 ft. garage, on South Main St. Estimated cost, $100,000. T. Atherton Jr., Coal Exchange Bldg., Archt.

SOUTHERN STATES

Tenn., Chattanooga—The Somerville Iron Wks., Somerville, N. J., has awarded the contract for the construction of a factory, here, to produce about 50,000 tons of castings annually. Estimated cost, $1,500,000.

Va., Richmond—The Patrick Young Co., 9th and Byrd Sts., is having plans prepared by the C. L. Brooks Eng. Co., Engrs., Moultrie, Ga., for the construction of a meat packing plant, on Hermitage Rd. and Lehigh St. Estimated cost, $150,000.

MIDDLE WEST

Ill., Chicago—The Chicago Solder Co., 218 North Union Ave., will soon award the contract for the construction of a 2 story, 50 x 250 ft. addition to its plant, at 218 North Union Ave. Estimated cost, $100,000. Schmidt, Garden & Martin, 104 South Michigan Ave., Archt.

Ill., Chicago—B. P. Miller, 10855 South Michigan Ave., has awarded the contract for the construction of a 2 story, 105 x 128 ft. automobile sales and service station, on Michigan Ave. and 109th St. Estimated cost, $75,000.

O., Alliance—The Koch Bros. Co., 436 East Main St., is having plans prepared by Albrecht-Wilhelm & Kelly, Archts., 1836 Euclid Ave., Cleveland, for the construction of a 2 story, 91 x 113 ft. garage. Estimated cost, $50,000.

O., Cincinnati—The Cincinnati Refrigerating Co., Lincoln Ave., plans to build an 80 x 200 ft. plant for the manufacture of ice making plants suitable for installation in private homes.

O., Cincinnati—H. Hake, Archt., Telephone Bldg., has prepared preliminary plans for a large steel plant to be located on site now being negotiated for, near here. Buildings and furnaces will cover 15 to 20 acres and 400 additional acres will be needed for storage and railroad facilities. Estimated cost, $15,000,000. Owners name withheld.

O., Cleveland—The Astrup Awning Mfg. Co., 2937 West 25th St., has awarded the contract for the construction of a 1 story, 50 x 100 ft. garage, at 2937 West 25th St. Estimated cost, $50,000.

O., Cleveland—The Champion Machine and Forge Co., East 71st St. and Union Ave., will soon award the contract for the construction of a 3 story, 60 x 120 ft. addition to its factory. Estimated cost, $75,000. E. McGeorge, 1900 Euclid Ave., Archt.

O., Cleveland—The Crucible Steel Forge Co., 6600 Grant Ave., has awarded the contract for the construction of a 1 story, 60 x 900 ft. roll mill, annealing plant and machine shop. Estimated cost, $500,000. D. W. Wells, Mgr.

O., Cleveland—J. Lampkovitz, 2959 East 55th St., manufacturer of stove fixtures, will build a 1 story, 47 x 60 ft. addition to its factory. Estimated cost, $8,000.

O., Cleveland—The Regar Brass Co., 1523 East 45th St., has awarded the contract for the construction of a 1 story, 24 x 42 ft. furnace building, on East 45th St. and Superior Ave. Estimated cost, $7,000.

O., Cleveland—The Retail Butchers' Protective Association, 3199 West 65th St., has awarded the contract for the construction of a 1 story, 75 x 90 ft. factory. Estimated cost, $10,000.

O., Cleveland—The Van Dorn Iron Wks. Co., 2685 East 79th St., has awarded the contract for the construction of a 3 story, 120 x 100 ft. and a 3 story, 180 x 240 ft. factory, on East 79th St. and Woodland Ave. Estimated cost, $600,000.

O., Columbus—The Whitsit Realty Co., 80 West Broad St., will soon award the contract for the construction of a 3 story, 62 x 120 ft. warehouse, on 5th and McKee Sts. Estimated cost, $100,000. E. E. Pruitt, 209 South High St., Archt.

O., Lorain—The Thew Automatic Shovel Co. has awarded the contract for the construction of two 1 story, 75 x 200 ft. factories. Estimated cost, $150,000.

Wis., Manitowoc—The Aluminum Products Co. plans to build a 4 story, 60 x 250 ft. factory, on 8th St., for the manufacture of aluminum ware. Estimated cost, $100,000. B. Dolwig, Pres.

Wis., Milwaukee—The Pelton Steel Co., 672 Kinnickinnie Ave., will soon award the contract for the construction of a 1 story, 60 x 100 ft. addition to its foundry. Estimated cost, $35,000. Judell & Bogner, 1st Wisconsin Natl. Bank Bldg. Archt.

Wis., Milwaukee—The A. O. Smith Corp., 27th and Keefe Aves., manufacturer of pressed steel products, will soon award the contract for the construction of a 1, 2 and 3 story, 360 x 870 ft. factory, on 27th St. Estimated cost, $1,500,000. H. J. Esser, Camp Bldg., Archt.

WEST OF THE MISSISSIPPI

Kan., Topeka—The Trefrey Motor Co. plans to build a 5 story, 75 x 100 ft. garage. Estimated cost, $100,000. W. E. Glover, Topeka, Archt.

Kan., Wichita—The Red Star Milling Co., 1901 North Emporia St., has awarded the contract for the construction of a 9 story, 60 x 170 ft. mill. Estimated cost, $750,000.

Mo., East St. Louis—The American Range Co. has purchased a site at 20th and State St. and plans to build a factory for the manufacture of stoves.

Tex., Houston—The York Eng. & Supply Co., 611 Franklin St., is building a refrigerating machinery plant. Estimated cost, $55,000.

WESTERN STATES

Ore., Portland—The Oregon Pipe Organ Co., Piedmont, is having plans prepared by E. Bergholtz, Archt., 807 Spaulding Bldg., for the construction of a 2 story, 75 x 100 ft. factory. Estimated cost, $35,000.

CANADA

B. C., Vancouver—The Britannia Wire Co., c/o Gibsons, Ltd., 101 Water St., manufacturer of wire cable and rope, has awarded the contract for the construction of a 1 story, 120 x 200 ft. factory, on Industrial Island. Estimated cost, $40,000. Noted Jan. 15.

B. C., Vancouver—Coughlan & Sons, Front and Columbia Sts., will build a dry dock and repair plant, on Burrard Inlet. Estimated cost, $3,750,000.

General Manufacturing

NEW ENGLAND STATES

Conn., Waterbury—D. E. Carroll, 176 Meadow St., manufacturer of fruit and grain products, has awarded the contract for the construction of a 4 story, 70 x 90 ft. factory, on West Main St. Estimated cost, $100,000.

Conn., Westport—The Dolge Chemical Co. has awarded the contract for the construction of a 1 story factory. Estimated cost, $40,000.

Conn., Windsor Locks—The J. R. Montgomery Co., manufacturer of mercerized cotton yarns, will soon award the contract for the construction of a 2 story, 80 x 200 ft. factory. Estimated cost, $100,000. Ford, Buck & Shelelm, 60 Prospect St., Hartford, Archts.

Mass., Fall River—The American Thread Co., Kerr St., has awarded the contract for the construction of a 5 story, 100 x 275 ft. addition to its mill. Estimated cost, $700,000.

Mass., Fall River—The Chace Mills, Rooman St., has awarded the contract for the construction of a 1 story, 51 x 100 ft. addition to its picker building. Estimated cost, $30,000.

Mass., Malden—C. H. Moss, 48 Grass St., plans to build a 1 story, 50 x 100 ft. factory, on Pearl St., for the manufacture of preserves. Estimated cost, $40,000.

Mass., New Bedford—The Continental Wood Screw Co., Mt. Pleasant St., will soon award the contract for the construction of a 2 story, 52 x 80 ft. and 30 x 40 ft. addition to its factory. Estimated cost, $45,000. C. Hammond & Son, 179 North Water St., Archts.

Mass., Salem—The Parker Bros. Co., 190 Bridge St., manufacturers of games, has awarded the contract for the construction of a 3 story, 50 x 140 ft. addition to its factory. Estimated cost, $35,000.

R. I. Westerly—The Ninigret Mills Co., Canal St., will soon award the contract for the construction of a 4 story, 135 x 500 ft. spinning mill. Estimated cost, $600,000. C. T. Main, Devonshire St., Boston, Archt.

R. I., Woonsocket—The Novelty Knitting Co., Allen St., has awarded the contract for the construction of a 3 story, 25 x 50 ft. addition to its mill. Estimated cost, $20,000.

R. I., Woonsocket—The Woonsocket Rubber Co., 87 Fairmount St., has awarded the contract for the construction of a 1 story, 40 x 90 ft. addition to its factory. Estimated cost, $15,000.

Vt., St. Johnsburg—The Cary Maple Sugar Co. is having plans prepared by Webster & Libby, Engrs., 534 Congress St., Portland, for the construction of a factory and boiler house, on Portland St. Estimated cost, $150,000.

MIDDLE ATLANTIC STATES

N. J., Woodbridge—The Reliable Chemical Co., c/o Westinghouse, Church, Kerr & Co., Inc., Engrs., 37 Wall St., New York City, has awarded the contract for the construction of a factory and storage house, near here. Estimated cost, $150,000.

N. Y., Clayton—The Taggarts Paper Co., Sherman Bldg., Watertown, has purchased a 100 acre site at Steeles Point, with frontage on the St. Lawrence River and adjacent to tracks of New York Central R.R., and plans to build a wood preparing plant, storage house and loading conveyors. Estimated cost, $100,000.

N. Y., Little Falls—The Wool Products Co., 337 Engine St., has purchased the plant of the Rockton Knitting Co., here, and plans to improve and make extensive additions to same. Estimated cost, between $75,000 and $85,000. M. J. Stabin, Pres.

N. Y., Massena—J. J. Taylor, Water St., plans to build a grist and grain milling plant, to replace one which was recently destroyed by fire. Estimated cost, between $90,000 and $100,000.

N. Y., New York (Borough of Brooklyn)—B. M. Maltz, painter and decorator, c/o B. W. Dorfman, Archt., 26 Court St., will build a 5 story factory, on Grand Ave. and Dean St. Estimated cost, $200,000.

N. Y., New York (Borough of Manhattan)—The William St. Realty Corp., 19 Cedar St., will build a 6 story printing plant at 182 William St. Estimated cost, $55,000. Knowes & Basso, 280 Madison Ave., Archt.

N. Y., Oneida—The G. A. Taylor Co., 110 Madison St., plans to build a flour mill, to replace one which was recently destroyed by fire. New machinery and equipment will be installed in same. Estimated cost, between $150,000 and $175,000.

N. Y., Phelps—The Wilson Canning Co., Mexico, plans to build a canning factory, warehouse and office building. Estimated cost, $15,000 to $18,000.

N. Y., Utica—The Bowen Mfg. Co., 401 Columbia St., manufacturer of paper and twine, has awarded the contract for the construction of a 1 story, 102 x 225 ft. factory. Estimated cost, $29,000.

N. Y., Utica—The L. K. Hosiery Co., 1220 Leeds St., has awarded the contract for the construction of a 1 story, 30 x 35 ft. addition to its plant. Estimated cost, $21,000.

N. Y., Utica—The Utica Cutlery Co., 820 Hickory St., has awarded the contract for the construction of a 3 story, 55 x 200 ft. addition to its plant. Estimated cost, $125,000.

N. Y., Watertown—The Mohican Co., 280 Broadway, New York City, has purchased the Smith Bldg., here, and plans to make extensive alterations and convert same into baking plant. Estimated cost, between $60,000 and $70,000.

N. Y., Watertown—The Taggarts Bros. Co., 595-597 Main St., W., plans to build a paper bag factory, adjacent to its present plant. Estimated cost, between $80,000 and $100,000.

Pa., Ashley (Wilkes-Barre P. O.)—The Roberts Knitting Co., Manhattan St., plans to build a 2 story, 60 x 180 ft. factory, for the manufacture of stockings. Estimated cost, $50,000.

Pa., Bloomsburg—The Columbia Silk Throwing Co. is having plans prepared by C. J. Schmitt and G. H. Schroeder, archts., Witzenkorn Bldg., Wilkes-Barre, for the construction of a 1 story, 100 x 109 ft. mill. Estimated cost, $50,000.

Pa., Bristol—The Bristol Printing Co., 206 Mill St., has awarded the contract for the construction of a 3 story, 60 x 90 ft. printing plant. Estimated cost, $40,000.

Pa., Forty Fort (Kingston P. O.)—The Passaic Silk Co. has awarded the contract for the construction of a 1 story, 137 x 137 ft. mill, on Simpson and Durkee Sts. Estimated cost, $37,800.

Pa., Frankfort Junction (Philadelphia P. O.)—The Belmont Packing and Rubber Co., 133 North 2nd St., Philadelphia, plans to build a 2 story, 120 x 120 ft. factory. Estimated cost, $60,000. C. P. Berger, South Penn Sq. Bldg., Philadelphia, Archt.

Pa., Johnstown—The Lee Strauss Co., 232 Levergood St., plans to build a 3 and 5 story, 55 x 100 ft. chemical plant and office building. Estimated cost, $150,000. H. M. Rodgers, Trust Bldg., Archt.

Pa., Kingston (Wilkes-Barre P. O.)—The Crane Silk Co., 416 West Elm St., will soon award the contract for the construction of a 2 story, 50 x 125 ft. silk mill, on Rutter Ave. Estimated cost, $75,000. G. S. Welch, Coal Exchange Bldg., Wilkes-Barre, Archt.

Pa., Marietta—The Star Silk Co., Shamokin, plans to build a 2 story, 40 x 130 ft. silk mill, on Shamokin Rd. Estimated cost, $50,000.

Pa., Parsons (Wilkes-Barre P. O.)—The Leon Ferenbach Silk Co., has awarded the contract for the construction of a 2 story, 50 x 112 ft. silk mill. Estimated cost, $40,000.

SOUTHERN STATES

Ala., Birmingham—The Ridgeway Paper Stock Co., 1619 Ave. E., plans to build a 100 x 250 ft. mill (to have a daily capacity of 50 tons), for the manufacture of wrapping paper, box board and corrugated board. Estimated cost, $250,000.

Va., Petersburg—The Index Appeal and Evening Progress has awarded the contract for the construction of a 2 story, 75 x 100 ft. publishing plant, on Tabbe St. Estimated cost, $90,000.

Va., Richmond—The Simmons Co. is having plans prepared by M. D. Hetherington, Archt., Chicago, for the construction of a 2 story 100 x 160 ft. factory, on Hull St., for the manufacture of mattresses. Estimated cost, $90,000.

MIDDLE WEST

Mich., Saginaw—The Lufkin Rule Co., Hess Ave., plans to build a 1 story, 115 x 219 ft. factory, on Hess Ave. and Prescott St., for the manufacture of tapes. Estimated cost, $100,000. Esselstyn, Murphy & Hanford, 810 Marquette Bldg., Detroit, Archts. and Engrs.

O., Cincinnati—The Baldwin Piano Co., Gilbert Ave., has awarded the contract for the construction of a 7 story, 84 x 370 ft. factory. Estimated cost, $1,000,000.

O., Cincinnati—The Collins Ice Cream Co., 2911 Woodburn Ave., has awarded the contract for the construction of a factory, on Elsinore Ave. Estimated cost, $75,000.

O., Cincinnati—The Jarecki Chemical Co., St. Bernard, has awarded the contract for the construction of a 2 story, 150 x 500 ft. factory. Estimated cost, $500,000.

O., Columbus—The R. A. Rood Box Co., West End Buttles Ave., has awarded the contract for the construction of a 2 story, 60 x 100 ft. factory. Estimated cost, $20,000.

O., Willoughby—The Thor Tire and Rubber Co., 802 Society for Savings Bldg., Cleveland, plans to build a 1 and 2 story, 82 x 180 ft. rubber factory, on Main St. along tracks of New York Central R.R. Estimated cost, $150,000.

Wis., Milwaukee—G. Ziegler Co., 362 Florida St., has awarded the contract for the construction of a 7 story, 80 x 112 ft. factory, for the manufacture of candy.

Wis., Sheboygan—The Badger State Tanning Co., South Water St. and Maryland Ave., plans to build a 4 story, 200 x 600 ft. tannery. Estimated cost, $1,000,000.

WEST OF THE MISSISSIPPI

Ia., Des Moines—The Hawkeye Tire and Rubber Co., 215 East 3rd St., has awarded the contract for the construction of a 3 story, 80 x 280 ft. factory. Estimated cost, $300,000.

Minn., Minneapolis—The Schurmeier Mfg. Co., 320 East 9th St., St. Paul, has awarded the contract for the construction of a 4 story, 100 x 140 ft. factory, on 5th St., N., for the manufacture of wagons. Estimated cost, $150,000.

Okla., Fredrick—The Fredrick Oil and Refining Co. has awarded the contract for the construction of a refinery. Estimated cost, $100,000.

Tex., Houston—W. H. Irvin, Hemphill and Railroad Sts., will soon award the contract for the construction of a 4 story, 42 x 84 ft. ice plant and ice cream factory. Estimated cost, $50,000. Finger & Cato, 601 Kress Bldg., Archt.

WESTERN STATES

Ore., Eugene—The Tillamook Lumber Co. recently incorporated with $50,000 capital stock has purchased 60,000,000 ft. of spruce land between Wilson and Kilchis Rivers, and plans to build a 1 story sawmill, to have 50,000 ft. daily capacity. Estimated cost, $25,000.

Ore., Hillsboro—Ray & Son, Sherlock Bldg., Portland, will soon award the contract for the construction of a 2 story, 86 x 370 ft. cannery. Estimated cost, $60,000. E. E. McClaren, Lumber Exchange Bldg., Portland, Archt.

Ore., Woodburn—O. Effenberger, W. Effenberger and T. Parson, plan to build a 1 story sawmill and box factory, to have 15,000 ft. daily capacity. Estimated cost, $15,000.

CANADA

B. C., Vancouver—The British Columbia Fir and Cedar Lumber Co., foot of Laurel St. will build a 1 story sawmill. Estimated cost, $10,000.

B. C., Vancouver—J. Storey, 518 Beatty St., will soon award the contract for the construction of a 4 story, 50 x 120 ft. printing shop. Estimated cost, $50,000. W. F. Whiteway, 1406 Dominion Bldg., Archt.